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ALIEN PROPERTY CUSTODIAN

ELECTRIC BELLS

Johann Gottschlich, Vienna XIX, Germany;
vested in the Alien Property Custodian

Application filed December 5, 1940

This invention relates to an electric bell which, compared with known types, is distinguished by simplicity of construction, the requirement of very few simple accessories and therefore its primary costs are very low. A further advantage of the bell according to my invention is the feature that in spite of a little amount of current required an intense ringing is produced which is due to the fact that practically the whole magnetic power flow traverses an iron member which is interrupted only by very small air spaces. With the same amount of current used the bell attains a wider range of oscillations than other types of bells, thereby the sound becomes more intense and the adjustability is improved. The bell can be operated with continuous or alternating current.

The advantages of this invention are obtained by a magnetic coil resting on a central core of an E shaped or bell shaped magnet member which is movably fixed on a spring, the other end of the spring being fastened to the pedestal, the bell member forming the terminal yoke for the E shaped or bell shaped magnet member which strikes against the bell member when it oscillates.

The drawing shows two embodiments of the subject matter, Fig. 1 shows a bell, in axial section, partly cut, and Fig. 2 shows a cross sectional view, indicated by the line II—II in Fig. 1; Fig. 3 shows a second modification of the invention in perspective illustrating the bell member partly cut out.

On a vertical supporting part 12 mounted on the pedestal 1, which is made of insulating material, is secured by means of the screw 2 a leaf spring 3 and at the free end of the spring is attached an U-shaped magnetic iron core 4. Between the supporting part and the magnetic iron core rests the core 6 carrying the magnetic coil 5, thus giving the whole magnetic member the shape of an E. On part 12 of the pedestal is also fixed a metal strip 7 on a screw 8 which serves at the same time as a connecting contact. The strip 7 carries at its free end a contact 9 which cooperates with a counter-contact 10 fixed at the spring 3.

At the bottom of the pedestal 1 are provided the connecting contact screws 13 and 14 from which lead the conduits 15 and 16 through the bores 17 and 18 of the pedestal to the magnetic coil 5 and the connecting screw 8 respectively. The circuit therefore is conveyed from the screw 13 through the conduit 15 to the magnet winding 5 and from the other end of the latter, which is conductingly connected with the magnetic core and the leaf spring 3, to the contact 10 and then through the contact 9, the strip 7, and the screw 8 through the conduit 18 to the screw 14.

The bell member 11 is fixed by means of a screw 19 on a tube 20 which is secured on the pedestal by the screw 21. The free ends of the lugs 4 and 6 of the magnetic member reach close up to the bell member which forms the magnetic terminal yoke and which is separated from the magnetic member 4 and 6 only by small air spaces. For adjusting the distance of the bell member 11 and the magnetic member 4 and 6 the fastening screw 19 may be a little eccentrically fixed on the bell 11, so that by turning the bell the size of the air spaces may be altered. Other devices for adjusting could also be used.

When the current is switched on, the magnetic core 4 is attracted by the bell and strikes against it with the end of the core 6. At that moment the contact 10 has separated itself from the counter-contact 9, so that by means of the spring 3 the known alternating interruption is caused. The fixing of the contact 9 on a metallic arm 7, which makes a light oscillation possible, supports the interruption, because the arm 7 oscillates itself. Furthermore a better cleanliness of the contact points 9 and 10 is attained by the oscillating movement of the contact 9.

Figure 3 shows an electric bell, suitable for an alternating current, comprising a bell member 32 which is mounted on a pedestal 31, a leaf spring 34 which is fixed on part 33 of the pedestal and a magnetic system consisting of a central lug 35 which carries the magnet winding 36 and a bell-shaped part 37 surrounding the latter. The conduits 38 and 39 lead from invisible connecting screws direct to the magnet winding 36.

When the current is switched on, an electromagnetic alternating flow is produced in the magnetic member 35 and 37 and in the bell member 32, the bell member being separated from the magnetic member only by small air spaces and serving as a magnetic terminal yoke. This alternating magnetic flow causes the magnetic member to oscillate and these oscillations make it strike against the bell member.

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Fig.1

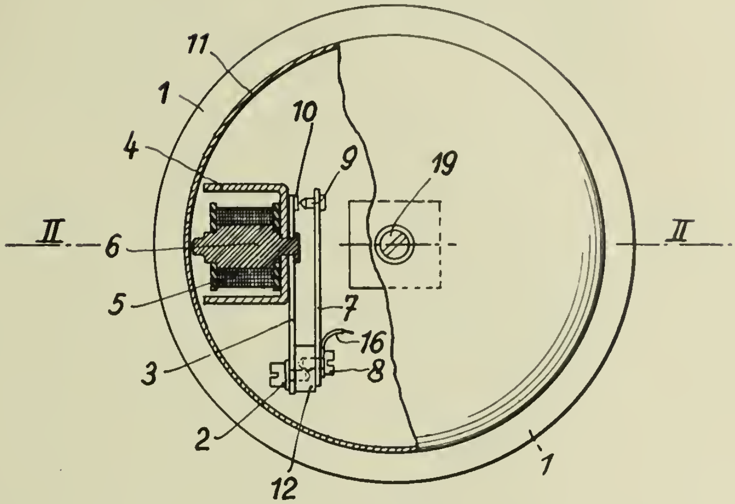


Fig.2

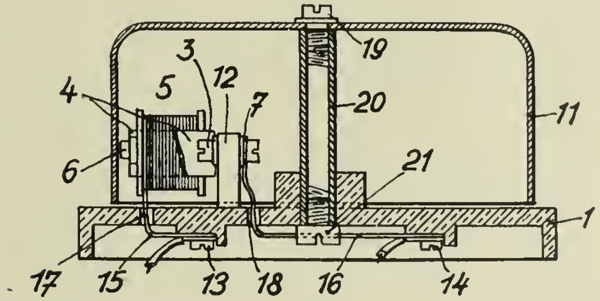
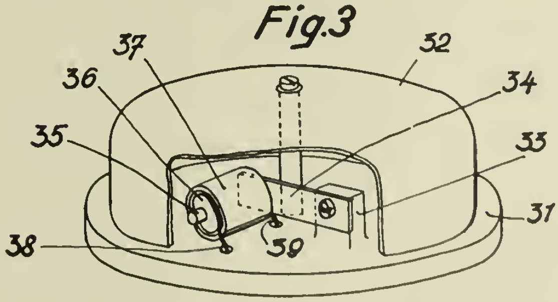


Fig.3



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ALIEN PROPERTY CUSTODIAN

APPARATUS FOR DELIVERING ROLLING MATERIAL FROM THE COOLING BED ONTO THE DISCHARGING LIVE ROLL GEAR BEDS

Hans Cramer, Dinslaken/Niederrhein, Germany; vested in the Alien Property Custodian

Application filed December 6, 1940

The high efficiency of a modern train of rolls can be mastered by one single, widely built cooling bed, but it is not possible to work up such great production also over one single discharging live roll gear bed connected to the cooling bed, with cutting shears arranged behind the live roll gear bed. In order to overcome this inconvenience, two discharging live roll gear beds have been arranged behind such single cooling bed. The constructions which have been become known up to the present do, however, not allow to fully utilize the discharging live roll gear beds and shears, as the conveying of the material to be rolled from the cooling bed to the two live roll gear beds was not independent on the operation of the live roll gear beds.

It has therefore been proposed, to make liftable and lowerable the live roll gear bed lying nearest in the conveying direction of the cooling bed, so that the material to be rolled can pass under the lifted first live roll gear bed to the second live roll gear bed while the first live roll gear bed is still occupied. But also thereby absolute independence in the attention of the live roll gear beds is not attained as already in the group formation on the cooling bed their arrangement and operation has to be taken into consideration. Further this proposal possesses the serious inconvenience, that the live roll gear bed adapted to be raised and lowered is accessible only difficultly during the operation. For constructive reasons the application of this construction is restricted to quite short cooling beds.

Another proposal shows alternate tipping sliding ways for the attendance of the running off discharging live roll gear beds arranged the one at the side of the other. Owing to the irregular slipping off of the rods taking place at this occurrence it is not possible to bring the material to be rolled in a predetermined order and position in front of the shears, whereby additional delay is caused by the correspondingly required putting in order of the rods.

These inconveniences of the known constructions are the reason, for which double cooling beds, each one with a discharging live roll gear bed, have been rather provided, and one has put up with the much higher expenses for such a plant.

The present invention has for its object, to ensure an absolutely independent attendance of the two live roll gear beds and at the same time the possibility to deposit the rolled rods or the groups of rolled rods onto the live roll gear beds well ordered and convey them to the shears by a delivering device interposed between the cooling bed proper and the two absolutely independent discharging live roll gear beds and by a corresponding arrangement of the two discharging live roll gear beds.

An embodiment of the invention is shown by way of example in the accompanying drawing, in which

Fig. 1 shows a form of construction of the invention.

Fig. 2 shows a detail of this form of construction.

Figs. 3 and 4 show two other forms of construction of the invention, without, however, exhausting thereby the possibility of modifications according to the invention.

In Fig. 1 the cooling bed is designated by 1, the two live roll gear beds by 2 and 3. The motor 4 drives through a gear 5 a crank 6 which in its left hand and right hand dead centre position produces the upper and lower limitation of the position of the supporting lifting system 7, 8, 9, 10. The crank 6 is hingedly connected by a connecting rod 7 with one arm of a two-armed elbow lever 8, which is keyed on the revolvable shaft 11. The other arm of lever 8 engages hingedly on pin 12 of a supporting rod 10. A lever 9, rotatable about a shaft 14 is hingedly mounted on a pin 13 of rod 10. The free arm of lever 9 carries a counterweight 15 for balancing the weight of the whole supporting construction. An arm 17 and a sprocket wheel 27 are keyed on a shaft 16 which is revolvably mounted in the supporting rod 10 and in a sprocket wheel 30. The sprocket wheel 30 is otherwise rigidly connected with the supporting rod 10. The lever 17 carries a pin 18 at its free end and a sprocket wheel 28 is pivotally mounted on this pin 18, the supporting body 19 for the rolled rods being rigidly connected with this sprocket wheel. A chain 29 runs over the two sprocket wheels 28 and 30. A sprocket wheel 21 is keyed on a shaft 20 adapted to be revolved by a drive not shown. A double sprocket wheel 22 which is connected by a chain 23 to the sprocket wheel 21 and by a chain 24 to a double sprocket wheel 25 rotatable about pin 12 of the carrying rod 10 is mounted on shaft 11. The double sprocket wheel 25 is further connected by a chain 26 with a sprocket wheel 27. The shafts 20 and 11 extend along the whole length of the cooling bed; on this cooling bed the delivering devices are arranged at certain distance apart. As the drive 4, 5, 6, 7 is required only once, a simple lever which connects the shaft 11 with the carrying rod 10 is

sufficient for the other delivering devices instead of the elbow lever **8**.

The operation of the delivering device according to Figs. 1 and 2 is as follows:

By rotation of shaft **20** the chain **23**, the double sprocket wheel **22**, the chain **24**, the double sprocket wheel **25** and the chain **26** of the sprocket wheel **27** are actuated through the sprocket wheel **21** and thereby the shaft **16** is rotated and lever **17** oscillated, so that the supporting table **19** is brought from the position A shown in full lines into the position B indicated in dot lines. As the sprocket wheel **30** is rigidly connected with the supporting rod **10** and otherwise connected by the chain **29** with the sprocket wheel **28** rigidly fixed on the supporting table **19**, a movement of the supporting table **19** relative to the lever **17** takes place not only during the transmission from position A into position B, but also at any other oscillation of the lever **17**, so that the supporting table **19** remains always in the horizontal position.

By turning crank **6** the whole supporting construction and therewith also the supporting table **19** is lowered into the position C indicated in dot lines, whereby the supporting rod **10**, owing to the parallel guiding by the levers **8** and **9**, remains always in the vertical position. The supporting table can be brought then from the position C, by corresponding revolving of shaft **20** and by the oscillation of the lever **17** either into the position D shown in dot lines, or into the position E and thus the rolled material can be deposited on one of the two live roll gear beds **2** or **3**. The supporting table is brought from the position D or E by further oscillation into the position F. The delivering device is then lifted by turning of crank **6**, the supporting table brought into the position G and from this position by backward oscillation of the lever **17** again into the initial position A shown in the drawing so that a new operation can begin.

As the supporting table takes over the groups of rods in the above mentioned order from the cooling bed and as this order is maintained during the delivering to one of the two discharging live roll gear beds, the groups of rods are also brought in similar order to the shears. The live roll gear beds may further be attended independent the one on the other, as the supporting table can be brought, as desired, from the position C either into the position D or E, without disturbing in any way the operation on the other live roll gear bed.

According to Fig. 3 the delivering device **31** proper is shiftable in lateral direction on a table **32** which can be lifted and lowered, so that the delivering device **31**, either for depositing the groups of rolled rods onto the live roll gear bed **2** or **3**, can be brought from the position J through the position K into the position L. For depositing onto the live roll gear bed **2** the device is brought from the position L into the position M and then back into the position J. For delivering onto the live roll gear bed **3** the device is shifted sidewards from position L into the position N, then lowered into the position O, whence it returns into the initial position J in being merely shifted in lateral direction. Owing to the overlapping form of construction of the device **31** the attending of the live roll gear bed **3** is also possible without disturbing the operation on the live roll gear bed **2**.

As shown in Fig. 4, a rack **33** serves as delivering device proper, which rack is shiftable in lateral direction by a sprocket wheel **39** driven from the stationary shaft **34** through the intermediary of sprocket wheel **35**, chain **36**, double sprocket wheel **37** and chain **38**. The guide body **40** of rack **33** can be lifted and lowered. By corresponding position arrangement of the two live roll gear beds, both these live roll gear beds may be attended absolutely independent the one on the other also in this form of construction. The attendance of the live roll gear bed is effected through the intermediate positions Q, R, S, T, and the attendance of the live roll gear bed **3** through the intermediate positions Q, U, V, W.

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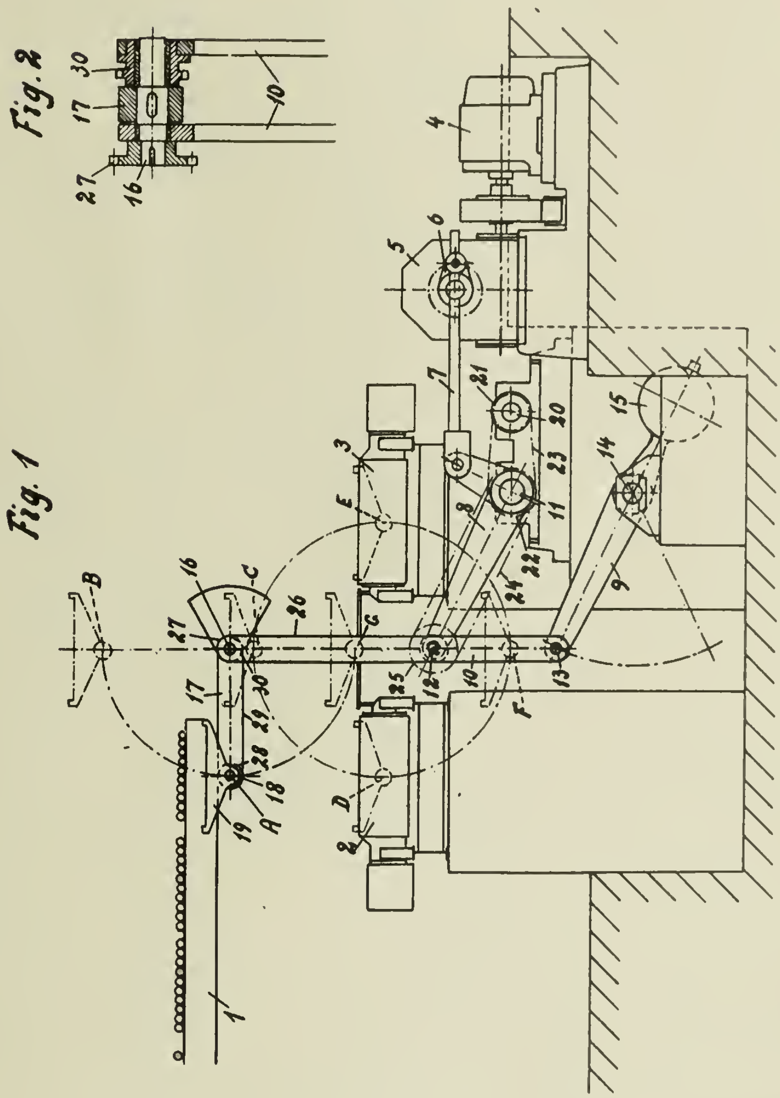
3 Sheets-Sheet 1



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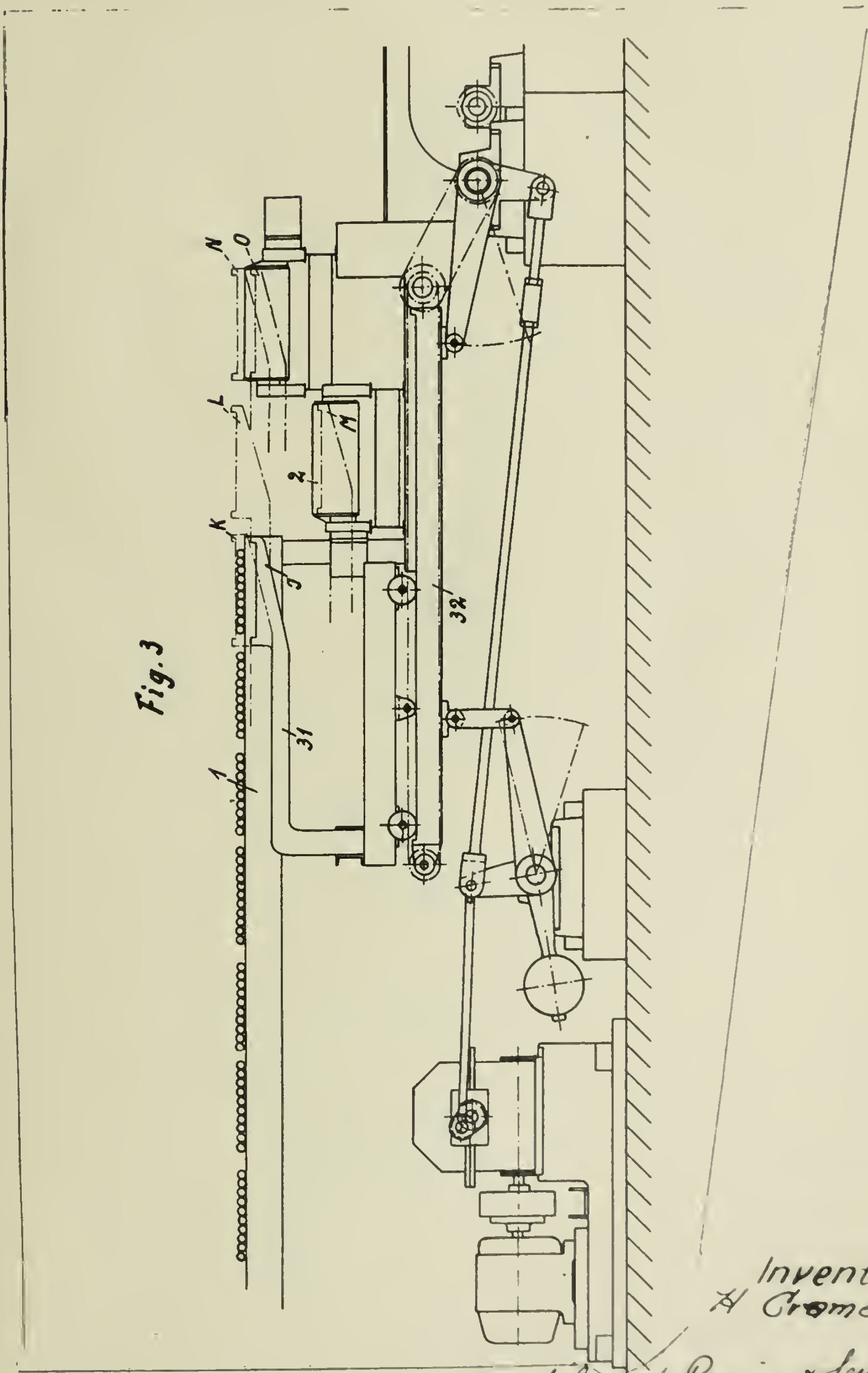
3 Sheets-Sheet 2



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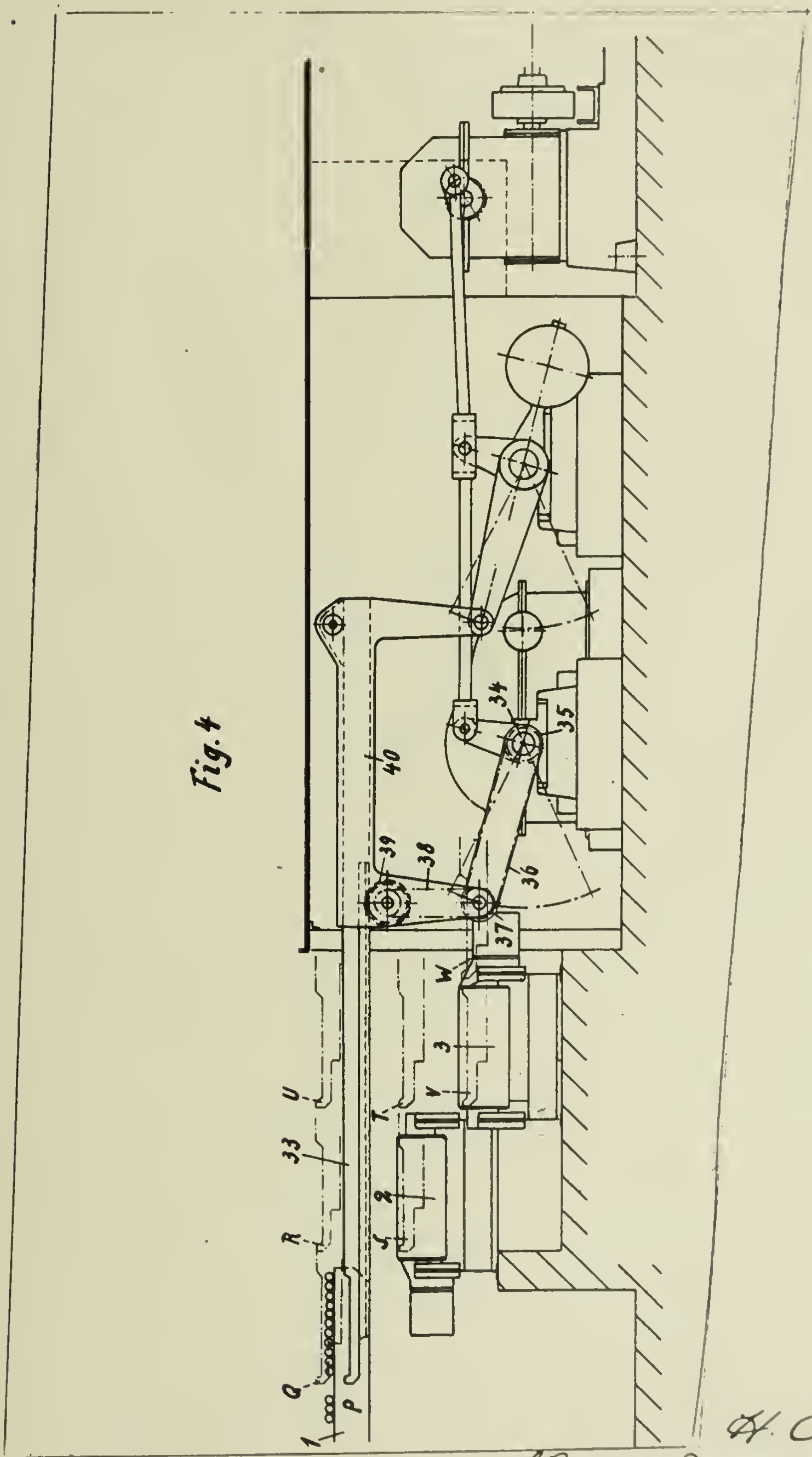
3 Sheets-Sheet 3

Fig. 4



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ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE REMOVAL OF GASES FROM MINERAL OIL REFINING PLANTS WHICH OPERATE WITH LIQUEFIED, AT NORMAL TEMPERATURE GASEOUS SOLVENTS

Alfred Hoppe, Berlin-Wilmersdorf, Germany; vested in the Alien Property Custodian

Application filed December 9, 1940

It is known to refine mineral oils, tars and the like by extracting and/or dewaxing and/or de-asphalting them with the aid of liquefied, at normal temperature gaseous solvents as e. g. sulfur dioxide or propane, or with the aid of mixtures containing solvents with a high vapour pressure. The solvents are recovered from the solutions resulting from the above treatments by evaporation and condensation of the vapours under pressure.

During the operation of such plants gases such as nitrogen, air or also low molecular hydrocarbon vapours get continuously into the solvent, for instance with the raw oil or by diffusion through valve packings; since they are not condensed under the prevailing conditions they accumulate in the condenser and condenser pressure collector, respectively. Also by the controlling instruments which must be installed in such plants and the operation of which is effected by gases, e. g. air, nitrogen or carbon dioxide, the latter ones get into the circulating solvent. The not condensed gases increase the pressure of the condenser system and, therefore, disturb the evaporation of the solvent and increase the load of the compressors.

Since the gases are mixed with solvent vapours, a relatively great amount of solvent gets lost when the gases are blown off from the collector.

The present invention suggests a method for the automatic removal of these gases from mineral oil refining plants without any substantial loss of solvent.

According to the invention the gases mixed with solvent vapours are continuously taken off from the collector, passed over a cooler, compressed to a pressure 5–30 atms. above the condenser pressure and subsequently cooled to a temperature at which the solvent contained in the gases is condensed to a large extent. The gases freed from solvent escape to the open air over a regulating valve which keeps the pressure of the high pressure cooler constant while the pressure condensate is led back into the solvent collector.

According to the invention, the solvent collector is fitted with a de-aeration system consisting of two coolers and the compressor between which sucks the gas-solvent-mixture off from the pre-cooler and presses it into the high pressure cooler.

The two cooling systems are preferably designed as fractionating columns, the lower part of which is packed e. g. with "Raschig"-rings and the upper part is equipped with a cooler.

When liquid solvent at lower temperatures is applied or obtained in refining plants, e. g. in plants in which wax is precipitated at low temperatures with the aid of SO_2 and auxiliary solvents such as benzol, or with the aid of propane or such-like, or in which light oil is extracted with SO_2 at extremely low temperatures (to $-60°$ C), it will be advisable to cool the cooling systems in the columns by means of the cold solvent. The cooling may also be effected by injecting liquid solvent from the collector into the cooling system and evaporating it preferably by means of the same compressors which serve for the sucking off and compression of the low pressure vapours from the plant in order to recover the solvent.

The de-aeration compressor is preferably operated with constant speed and acts, therefore, also as feed pump for the second cooling system. The latter is to be sized for such an amount of solvent that the solvent vapours in the cooling system are also entirely condensed when the compressor occasionally draws off completely pure solvent vapours.

In a plant operating e. g. with liquid sulfur dioxide the gases are sucked off from the collector at 5 atms. and are submitted in the second cooling system to a pressure of 10 to 20 atms. and temperatures from $-10°$ to $-30°$ C. Propane may be withdrawn at about 10 atms. and treated in the second cooling system at about 40 atms. and $-30°$ C.

Since the uncondensable gases are kept under elevated pressure they are advantageously used for the operation of the above mentioned measuring and regulating instruments. Such instruments are, for instance, necessary for the operation with solvent mixtures in order to adjust the mixing ratio of the mixture, e. g. of sulfur dioxide and benzol. The gases to be employed for the operation of these instruments are branched off entirely or partly behind the second cooling system and, having passed the instruments, are released to the open air, or in special cases they return to the condenser and the condenser pressure collector, respectively. That is why not condensable gases also circulate through the de-aeration device when no air from outside enters the plant.

A suitable equipment showing the various phases of the process according to the invention is illustrated in the enclosed drawing, designed for operation with liquid SO_2 as solvent.

The collector may be called S. On top of the collector is mounted a column K_1 half of which is packed with "Raschig" rings or the like.

The upper part of the column is equipped with a tubular cooler with the aid of which part of the sulfur dioxide contained in the gases is condensed and led back to collector S.

The gases from column K_1 are compressed in compressor P to approximately 10 atms. or higher and conducted to the second column K_2 the middle part of which is packed with "Raschig" rings. With the aid of a tube system the upper part of column K_2 is kept at a temperature at which the sulfur dioxide contained in the gases is condensed to a large extent. The condensate flows into the lowest part of column K_2 from where it is withdrawn over valve V_1 and led back to collector S. Valve V_1 can be adjusted automatically by an overflow device (not illustrated) installed in the bottom of column K_2.

The uncondensable gases practically free from sulfur dioxide leave cooler K_2 through valve V_2 or partly through valve L in order to be conducted as pressure gas to measuring instruments not shown on the drawing.

When the compressor P draws off pure sulfur dioxide from cooler K_1 valve V_2 closes automatically. Valve V_2 also closes automatically if the mixture drawn off by the compressor contains just such an amount of not condensable gases as is necessitated for the operation of the measuring instruments and which is passed through valve L.

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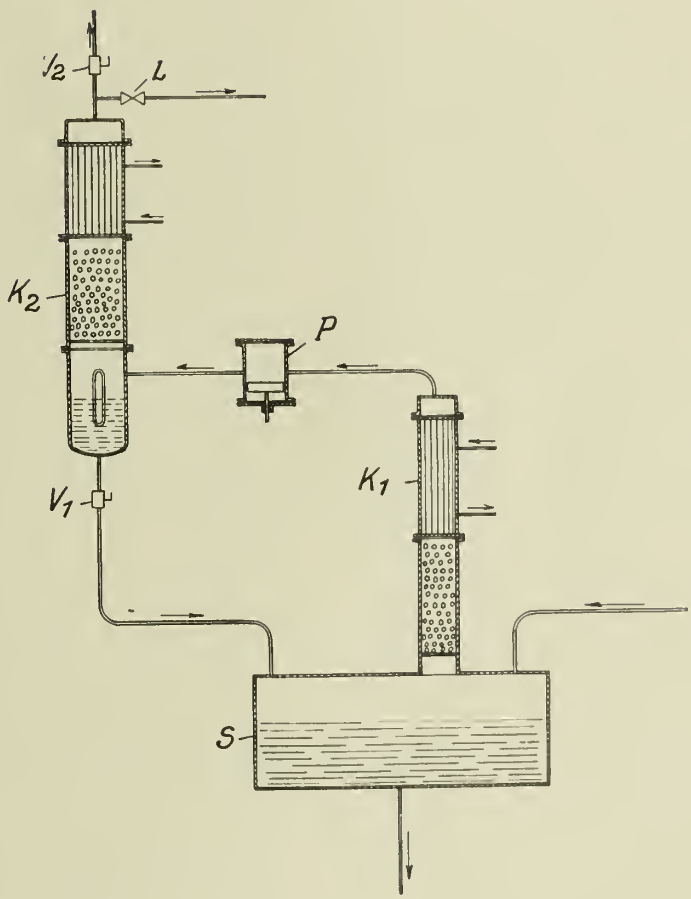

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His Attorneys

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ALIEN PROPERTY CUSTODIAN

MAGNETIC TESTING METHOD

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Application filed December 9, 1940

This invention relates to a magnetic method and apparatus for finding out discontinuities in the structure of test bodies and has particular reference to a method and apparatus for detecting cracks in cylindrical steel bodies and similar circular magnetisable test pieces.

It is an important object of the present invention to provide means for detecting cracks in magnetisable, round bodies independently of variations of the magnetic permeability of the body which are not caused by cracks or other mechanical discontinuities in the structure of the test bodies.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 is a perspective view of an arrangement for carrying out the invention.

Fig. 2*a* is a diagrammatic view, partly in section, of the same arrangement, including a circuit diagram of an amplifier for connection to the apparatus of Fig. 1.

Fig. 2*b* is a modified circuit diagram.

Fig. 3 is a diagrammatic fragmentary plan view, illustrating an arrangement for examining the whole length of test rods.

Similar characters of reference denote similar parts in the different views.

As here shown, I provide a small magnet having a narrow air gap arranged in close vicinity to a cylindrical test body of steel or the like which is transversely magnetised by a strong d. c. field and rotated about its axis. In this manner it is possible to define the magnetic interaction between the narrow air gap and the test body to the actual width of the crack to be investigated, independently of permeability variations extending throughout the cross section of the test body. Owing to the narrow air gap, amounting to a few hundredths of a millimeter only, the "stray field" caused by the crack is sharply defined, so that even with microscopically small cracks a very sharp indication is obtained. On the other hand, variations of the permeability of the material are not indicated, since such variations, caused, e. g., by structural mechanical stresses or strains, are continuous and in view of the low speed of the test body of about 5 to 10 revolutions per second have no noticeable effects upon the measurement, the scanning of the cracks being effected with a frequency exceeding this frequency by one or more decimal orders.

It will thus be understood that according to the invention the "stray field" of the test body is investigated by means of a magnet system having an air gap, the test body being moved relatively to the magnet system including the air gap.

According to the preferred form of the invention the cross-magnetised test body is rotated with respect to the stationary slit magnet system. It is also possible, however, if desired, to rotate the slit magnet system with respect to a stationary test body.

Referring now to the drawings in greater detail, and first to Fig. 1, a cylindrical test body **3** is rotated at a speed of 5 to 10 revolutions per second between the pole shoes of an electromagnet **1** which is magnetised by d. c. coils **2**. A second magnet system **4** is suspended from a rod **17** which is slidably mounted in a sleeve **4***b* fixedly secured in a bore of magnet frame **1**. Additional pole shoes **18** depending from a traverse **19** serve to lower the magnetic system **4** from its position of rest as indicated, into its operative position, by magnetic attraction of said pole shoes **18**, against a helical spring **4***a* bearing against an upper flange **6** on rod **17**. The gap **5** has a width of less than .05 mms, i. e., a few hundredths of one millimeter only, and in its lower operative position is spaced from the test body **3** by a certain distance which is determined by engagement of flange **6** with the upper end face of sleeve **4***b*.

Any variations of the magnetic flux induced in magnet **4** by the adjacent rotating test body thus will induce a current in its induction coils **20** which is supplied to an amplifier **7**, Fig. 2*a*. Through any suitable arrangement of thermionic tubes **21**, connected in cascade as shown, and a transformer **9**, the impulse is amplified and applied to a pair of vertical deflecting or measuring plates **22** of a cathode ray tube **10**, the time plates **23** of which are connected to a source of alternating current **11** having a frequency corresponding to the revolution number of the test body **3**. In order to ensure exact synchronism between the horizontal deflection of the cathode ray by the time plates **23** and the revolution number of the test body **3**, the latter may be driven by a synchronous motor, indicated schematically at **24**, which is supplied with alternating current from the source of current **11** or from a common main source of current, as indi-

cated in Fig. 2*a* in dotted lines. The amplifier advantageously is a mains-operated amplifier of low noise level, for instance, a measuring amplifier.

It will thus be understood that the cathode ray oscillograph **10** on its fluorescent screen normally will display a straight horizontal line, produced by the temporal deflection of the cathode ray, provided that the test body **3** is not rotated or has no cracks or other discontinuities in its structure. On the other hand, in case of any cracks or the like existing in the test body, the alternating current induced by such cracks in the coils **20** and amplified through the tubes **21**, is rendered visible on the screen of tube **10** in the form of a stationary or nearly stationary image, as indicated in Fig. 21.

It will be noted that the output transformer **9**, Fig. 2*a*, comprises an additional winding **30** for connection of an accoustic and/or optical indicator, such as a loudspeaker **16** producing a sound in case of any cracks in the test body **3**. In addition, a relay **15** may be connected, for effecting any desired switching operations, e. g., for assorting any test bodies **3** showing cracks. Moreover,where the output tube of the amplifier **7** is indirectly heated, the relay **15** may be used to switch in the driving motor **24** for the test body **3**, as indicated in Fig. 2*a*, thus rendering the testing device operative only when the amplifier **7** is operating.

Fig. 2*b* exemplifies a circuit for controlling an automatic assorting device (not shown). The amplified impulse in this case is impressed upon the grid of a control valve **13** permitting substantially unhampered passage of current from its cathode to the anode as a predetermined grid voltage is reached, while forming an absolute bar in case of a lower grid voltage (suitable valves being, e. g., gas discharge valves or valves known under the registered trade mark "Thyratron"). The ignition voltage of valve **13** may be adjusted by variation of a d. c. voltage inserted at **14**, in conformity with the minimum size of cracks which is to be indicated. The valve **13** serves for actuation of a relay system A, AS with delayed action (delayed attraction or delayed release) by which an assorting device (not shown) is automatically controlled.

Various modifications may be made without departing from the scope of the invention. For instance, the coils **2** may be energized by a. c. of suitable frequency, if desired. Further, the magnetic field of magnet **1** may be used to hold the test body **3** in axial and/or radial direction.

Where the whole length of longer rods is to be tested, it may be desirable to provide three or more magnet system **4**, **4'**, **4''** with air gaps **5**, **5'**, **5''**, etc., as indicated in Fig. 3, representing a section through the cores **29** of magnet **4**. The several magnet systems **4**, **4'**, **4''** may be connected to separate amplifiers and indicators, or to a common amplifier and indicator system. To this end, the induction coils of the various magnet systems **4**, **4'**, **4''**, may be connected in series.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

OTTO ENGLER.

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O. ENGLER

MAGNETIC TESTING METHOD

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Fig. 1

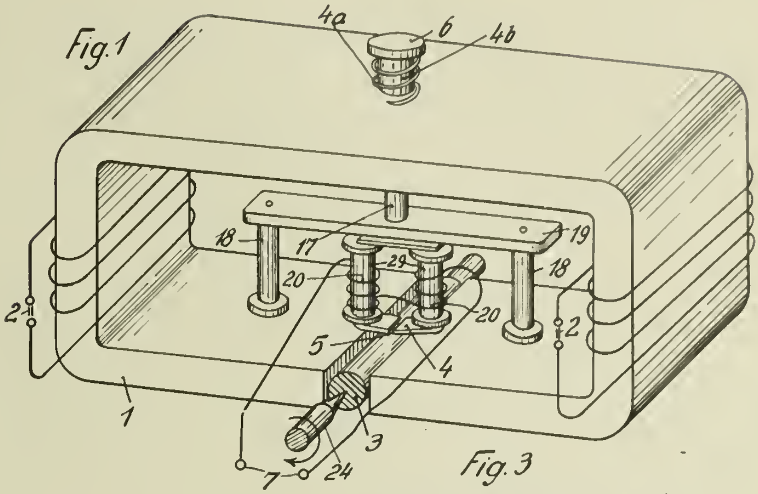


Fig. 3

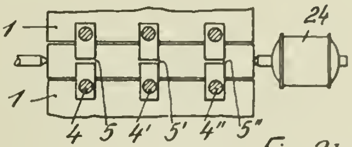


Fig. 2a

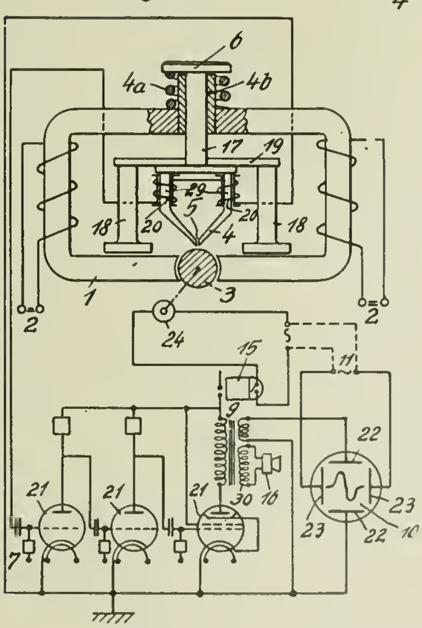
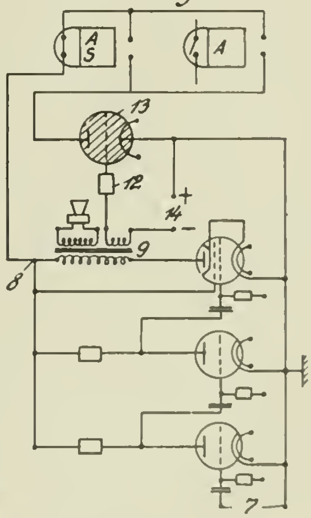


Fig. 2b



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Published May 18, 1943 Serial No. 369,500

ALIEN PROPERTY CUSTODIAN

DEMOUNTABLE HANGAR FOR AEROPLANES AND SEAPLANES

Georges Servan Cantacuzene, Paris, France; vested in the Alien Property Custodian

Application filed December 10, 1940

In time of war, aeroplanes are highly exposed to being bombed by the enemy aircraft, so long as they remain grouped in the large hangars which the conveniences of peacetime have caused to be built at the boundary of the aerodromes. This danger arises as much from the grouping of the aeroplanes as from the dimensions of the hangars which render them visible and recognizable from a great distance.

This drawback is obviated by dispersing the aeroplanes over a larger number of aviation fields. It is advantageous to change them, when they have been identified by the enemy.

Since the aeroplanes have to be maintained sheltered from the inclemencies of the elements, especially during bad weather, it is advantageous to replace the large hangars of peacetime by small campaign hangars, hardly visible, rapidly mountable and demountable, (and) readily transportable. This is the object of the present invention.

A hangar is, by nature, a construction comprising two essential elements; a strong framework defining an accommodation space and a covering fixed upon the framework and delimiting the said space.

Ordinary hangars, fixed or demountable, form a space of substantially parallelopiped shape. It follows from this that the available space is badly utilized, seeing that the aeroplane has a shape of which the wertical and lateral overall size is much less at the rear side than at the front side.

The hangar which forms the subject of the present invention is adapted, on the contrary, to the shape of the aeroplane, while the roof is sloped from the front towards the rear. An isolated hangar can be designed for a single aeroplane, or several individual hangars can be connected together in order to form a group or multiple hangar for two or more aeroplanes.

The invention is hereafter described with reference to the accompanying drawings, in which:

Fig. 1 represents diagrammatically in longitudinal vertical central section a suitable form of the improved hangar.

Figs. 2 and 3 are plan views showing diagrammatically an isolated hangar for an individual aeroplane and a group of hangars for several planes.

Figs. 4, 5 and 6 represent diagrammatically the hangar framework, Fig. 4 being a front elevation, Fig. 5 a side elevation, and Fig. 6 a plan view.

Figs. 7 and 8 represent in plan and in side elevation respectively the composition of the preferred attachments for assembly of the elements of the framework.

Figs. 9 to 12 represent similar views of two modified attachments.

Figs. 13 and 14 represent diagrammatically in central longitudinal section and in transverse section upon the line A—B of Fig. 13 respectively the improved hangar mounted within an excavation.

Figs. 15 and 16 are corresponding views of an alternative arrangement, Fig. 16 being in section upon the line C—D of Fig. 15.

The adaptation of the shape of the hangar to that of the aeroplane which it is to house is represented diagrammatically in Fig. 1, the roof **1** being inclined from the front towards the rear. The end wall **2** has a height sufficient to allow the passage of a man behind the aeroplane if the latter possesses, at this point, a height less than that of a man. The front wall **3** has a height slightly greater than that of the aeroplane, at this point.

Fig. 2 shows the said adaptation of shape in the case of an isolated hangar. The lateral walls **4** can follow the line of least overall size, in the lateral direction. It is possible to juxtapose the walls **4** of several hangars of this type combined together to form a multiple hangar for several aeroplanes or else to couple the several hangars along a straight common front line; however in this last case it is also possible, preferably, as shown in Fig. 3, to combine together several hangars of which the lateral walls **4'** are parallel.

This adaptation of the shape of the hangar to that of the aeroplane has the result of suppressing the useless space of the ordinary hangars. It follows that the hangar will profit from the following advantages: Economy in material—and therefore in the cost price, in the labour necessary for mounting and demounting, and in the weight to be transported during changes of site; reduction in the resistance opposed to the wind, whence greater stability, decrease of visibility for the aerial foe and facility of camouflage.

Another essential characteristic of the present invention is the mode of construction of the hangar. Like every hangar, the structure is provided with walls which must be rigid and impenetrable to wind and rain. Its front wall must, however, be removable in order to allow the exit and return of the aeroplane.

The front wall can be, for example, constituted by fabric curtains sliding laterally and suitably fastened when they block the entrance. The rigidity of the other walls is obtained by the use

of a framework which may be built up of wood or of sectional or tubular metal. This framework is characterized by the exclusion of separate supporting uprights, by the use, for the lateral and end walls, of rigid triangulated frames, by the division of these frames into elements of limited weight in such a way that each can be manipulated by two men during mounting and demounting, by the fixation of the walls to the ground by means of fittings traversed by metal screw pickets driven into the earth, and by a special arrangement of the sustaining trusses, which arrangement will be more fully described hereafter.

The triangulated frames forming the framework of the lateral walls are designated by **5**. Their upper members or top booms perform the function of wall plates upon which are fixed in a demountable manner the rafters **6** intended to support the roof, in concurrence with purlins **7** parallel to the said members.

The whole is supported and stiffened by transverse roof trusses to the number of at least three, viz:

(1) A front truss **8** which has a straight lower member or bottom boom and a curved upper member or top boom. Its supports are, by assembly, made fast with the upper corners of the lateral frames **5**. It is external to the closed space of the hangar. Struts **9** give it the necessary resistance to the wind;

(2) A middle truss **10**, which is made fast, by assembly and by the intermediary of its terminal uprights, to the lateral frames **5**. It has a straight upper member or top boom and a curved lower member or bottom boom, the latter having its concavity directed downwards. It is internal to the closed space of the hangar;

(3) An end truss **11** which is of the type having upper and lower members or booms parallel to one another. It forms the framework of the end wall of the hangar.

If the dimensions of the hangar require it, the number of the trusses in question may be increased, either to the exterior, or to the interior of the closed space. The hangar can, in this case, take the form, for example, of a prismatic body in rearward prolongation of a parallelopiped body.

The resistance of the hangar to the transverse forces is increased by guys **12** of which the lower extremity is fixed to the ground by a fitting traversed by a metal screw picket.

As described with reference to the lateral frames, the trusses are divided into sections or partial panels of which the weight allows their manipulation by only two men.

If several individual hangars are mounted in a group, the guys **12** are applied to the corner of the terminal cells of the multiple hangar.

The assembly together of the partial panels contributing to form the transverse trusses and the lateral frames, as well as the assembly connecting the principal rafters to the roof purlins and the purlins to the common rafters or transverse elements which support the roof, is effected by any suitable means allowing the demounting, for example by gussets and bolts, The assembly together of the partial elements, booms, lattice bars, struts, etc., contributing to form the said panels, is effected either by connectors of the current type, or, preferably, by attachments or which the object is to permit, first the standardization of their pattern, and secondly a fixation of the joints by plain clamping.

As shown in Figs. 7 and 8, a sheet-metal plate is pressed so as to present a split cylindrical portion **13**, adapted to be fixed by clamping upon the tube of the member **14**; lugs **15** are cut out from the two sides of the part **13** and turned back so as to make a fork to which the lattice bars or diagonals **16** are assembled by bolts **17**, while the free edges of the portion **13** provide two flat faces **18**, opposite to the attachment lugs **15** and traversed by bolts **19**, effecting the clamping of the split portion **13** upon the member **14**.

A modification of this assembly is represented in Figs. 9 and 10, where the sheet-metal plate is simply folded so as to present a cylindrical portion **20** and two flat edge portions **21**, traversed by bolts **19** serving for the clamping of the portion **20** upon the tube **14** and other bolts **22** serving for the assembly of the lattice bars or diagonals **16**.

The modes of assembly described above and represented by Figs. 7–8 and 9–10 respectively offer the advantage of allowing the fixation beforehand of the attachment upon the tubular member, independently of the sebsequent mounting of the lattice bars or diagonals.

It will however be possible to utilize attachments in which the fixing upon the tubular member and the mounting of the lattice bars or diagonals will take place simultaneously. This type of attachment, represented in Figs. 11 and 12, comprises only bolts **23** serving at the same time for the clamping of the split cylindrical portion **20** upon the member **14** and for the assembly of the triangulation elements **16**.

It will likewise be possible to constitute the panels composing the transverse trusses and the lateral frames by welding together the metallic elements tubes or profiled bars, according to the known technique.

With the object of obtaining a partial protection against bombing from the air, it will be possible to mount the hangar in an excavation of small depth, the spoil from the excavation serving for the establishment of a parapet protecting the sides and the end of the hangar against splinters from bursts, while an inclined plane allows the exit and return of the aeroplane. This arrangement is represented in Figs. 13 and 14.

It is possible likewise, with the object of reducing the height of the hangars, to dig a longitudinal pit or excavation of depth slightly less than the height of the landing carriage of the aeroplane and of width corresponding to its span, the said pit rejoining the ground surface, towards the front, by an inclined plane. This arrangement is represented in Figs. 15 and 16.

The ground, in the interior of the hangar or only upon the surface travelled by the wheels of the aeroplane, can be paved with removable slabs, such as those forming the subject of the French patent No. 327,752, dated October 11th 1937.

GEORGES SERVAN CANTACUZENE.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

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DEMOUNTABLE HANGAR FOR AEROPLANES
AND SEAPLANES
Filed Dec. 10, 1940

Serial No.
369,500

2 Sheets-Sheet 1

Fig. 1.

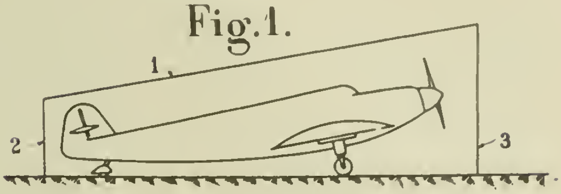


Fig. 2.

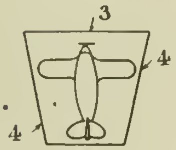


Fig. 3.

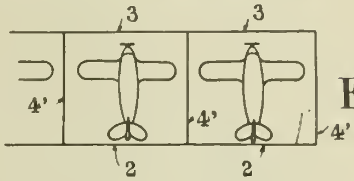


Fig. 5.

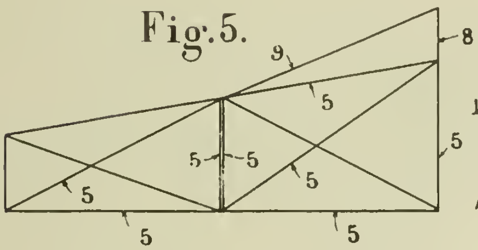


Fig. 4.

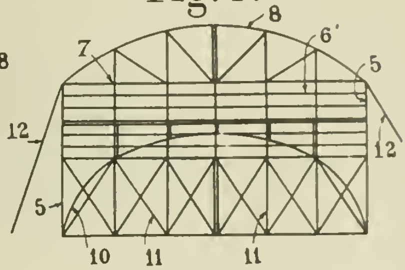


Fig. 6.

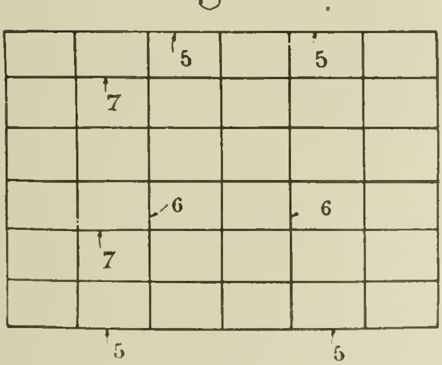


Fig. 8.

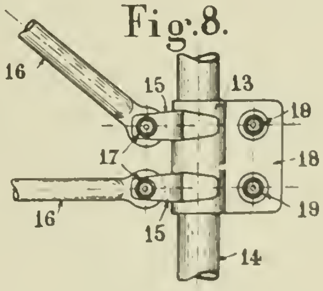
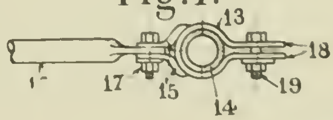


Fig. 7.



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2 Sheets-Sheet 2

Fig. 9.

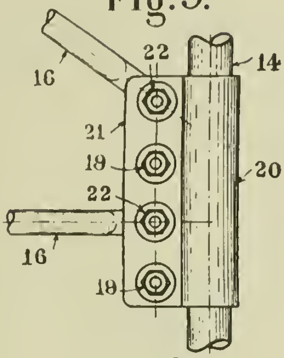

Fig.11.

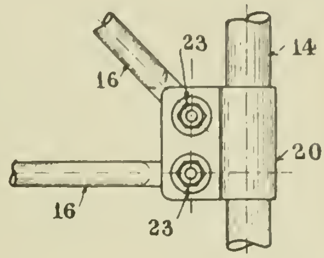

Fig.10.

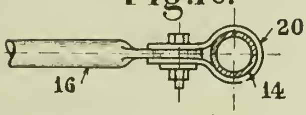

Fig.12.

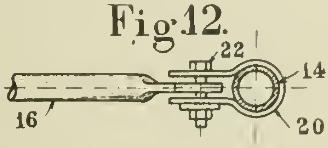

Fig.13.

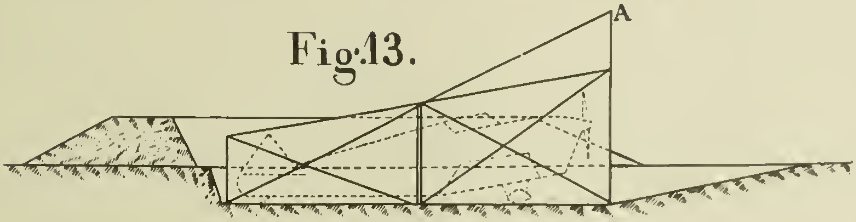

Fig.14.

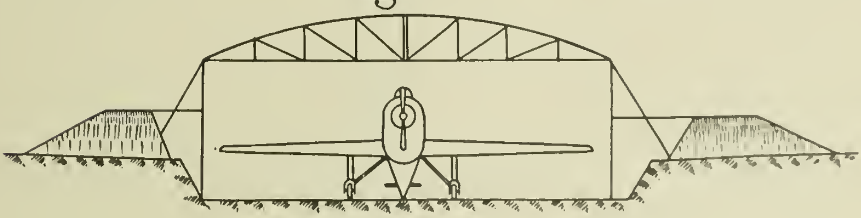

Fig.15.

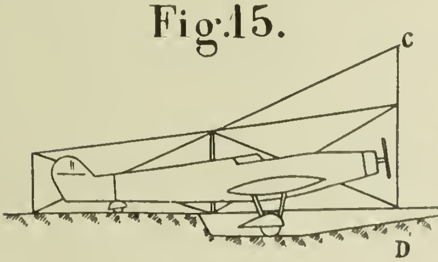

Fig.16.

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ALIEN PROPERTY CUSTODIAN

REFINING ALUMINIUM

Werner Helling, Braunau, and Ivar Bull-Simonsen, Grevenbroich, Germany; vested in the Alien Property Custodian

Application filed December 11, 1940

The present invention relates to a method of and a device for refining aluminium.

In refining aluminium according to the three layers method an alloy of aluminium with one or more specific heavier elements serves as lower anodic layer. Alloys having about 25–33% of copper are commonly used. Upon this anode metal floats the electrolyte, for instance a fusible mixture of fluorides and/or chlorides, upon which again separates the refined aluminium as the third layer which serves as cathode.

The admixtures of the raw aluminium and the alloy charged in the course of the operation of the cell to replace the aluminium transferred from the anode to the cathode enrich the anode layer. With the enrichment in high-melting foreign metals, for instance iron and manganese, the melting point of the anode alloy rises. To prevent freezing of the anode layer the enriched alloy must be totally or partially exchanged from time to time. The partial exchange of the anode metal may conveniently be carried out by special filling up holes provided in the lining of the cell.

If primary aluminium is used as charge the enrichment of the anode alloy in the elements iron and silicon is so slow that small amounts of contaminated anode alloy only result which without difficulties may be blended to copper containing alloys, for instance duraluminium. If, however, the refining cell is used for treating old metal or alloys resulting from the thermal reduction of aluminium ores, than a more frequent exchange or regeneration of the anode alloy must be effected, because the charge contains larger amounts of high-melting contaminations than the primary aluminium.

If for instance the aluminium, electrolytically withdrawn from the anode alloy, is replaced by an alloy "L" having 1,2% of copper, 0,5% of magnesium, 0,8% of manganese, 0,8% of Si, 0,5% of Fe, and 95,7% of Al, then with a daily output of the cell of 100 kg. refined aluminium and with a corresponding addition of the alloy "L" the anode metal is approximately adjusted to the following composition:

Withdrawal of 100 kg anode metal per cell in	Composition			
	Cu	Fe	Si	Mn
	Per cent	*Per cent*	*Per cent*	*Per cent*
A. 2 days	30	1,5	2,4	2,4
B. 4 days	30	2,5	4,0	4,0
C. 6½ days	30	3,8	6,0	6,0

The magnesium may in this case be neglected, because it is removed according to a special method before the alloy is introduced into the cell.

With a monthly output of 30,000 kg. amounts of contaminated anode metal result in case

	Kg. per month
A	15,000
B	7,500
C	4,600

The number of exchanges necessary to maintain an undisturbed operation of the cell not only depends on the composition of the added alloy but also on the temperature at which the cell is operated. The preferably used electrolytes require a cell temperature of 800° C. If the alloy "L" is introduced in a cell operated at this temperature, then an exchange of the anode alloy is necessary after at least 6½ days, if a disturbing separation of high-melting crystals at the bottom of the cell is to be prevented. In most cases, however, the alloys to be added will have a still larger content on high-melting constituents, so that a still more frequent exchange must be effected.

Now, the frequent withdrawal of anode alloy and the replacement of the latter disturb the mode of working of the already unstable cell operating with three liquid layers. These difficulties are removed by the invention and this mainly by the fact that at certain spots of the cell the anode metal is adjusted to temperatures at which segregation of the foreign metals occurs and furthermore by the fact that the segregation grains are removed continuously or from time to time.

Other features of the invention may be gathered from the following description given by way of the accompanying drawing showing a device for carrying out the method according to the invention.

In this drawing:

Fig. 1 is a vertical section through a cell according to the invention, and

Fig. 2 is a plan view of this cell partially in horizontal section.

In the cell shown in the drawing the layer **1** is formed by pure aluminium, the layer **2** by an electrolyte consisting of a salt mixture, and the layer **3** of anode metal. The bottom **5** of this cell, located above the insulating stones **6**, consists of carbon and is connected to the positive pole of a source of current. The side wall **9** consists of magnesite brick und is separted from the brick work located behind this wall by an insulating layer **8** formed of ground magnesite. The pure

aluminium forming the layer 1 is suitably connected to the negative pole of the source of current, for instance by a cathode which is not shown in the drawing and is immersed into this layer. The cell, moreover, is provided with two forehearths 4 connected to the effective space of the cell by channels which during operation, however, communicate with the layer 3 only, so that the anode metal only reaches the forehearths.

As is most cases the temperature range within which segregation may effectively be carried out is very narrow, the forehearths are provided with devices controlling the temperature by which simultaneously freezing of the anode alloy may be prevented in the connecting channels between the cell and the forehearths. The cover 7 with the heating device 10 serves this purpose. In case that, for instance due to the composition of the electrolyte, the cell may be operated at such a temperature that segregation starts already at the bottom of the cell proper or in the connecting channels it has been found preferable to arrange the bottom of the cell downwardly sloping towards the forehearths and to provide a connection between the forehearths 4 and the cell proper of such dimensions that the entire bottom of the cell may be subjected to the action of rabble tools introduced from the forehearths.

The temperature of the forehearths is so regulated that the foreign metals segregate the proportional amount of which increases in the anode layer in accordance with the progressive refining of the aluminium. After opening the cover 7 the segregation grains are removed from the forehearths preferably in definite not too large intervals of time. Fresh anode alloy and aluminium to be refined respectively are introduced into the forehearths. When using the above mentioned alloy "L" the composition of the segregation grains is about as follows: 18.3% of Fe, 3.8% of Mn, 9.5% of Cu, 3.0% of Si, rest Al.

It may be gathered from the above explanations that by the segregation a very large proportion of the foreign metal may be removed from the anode alloy, whereby the undisturbed continuous progress of the refining may be ensured.

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BY A. P. C.

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REFINING ALUMINIUM

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Fig.1

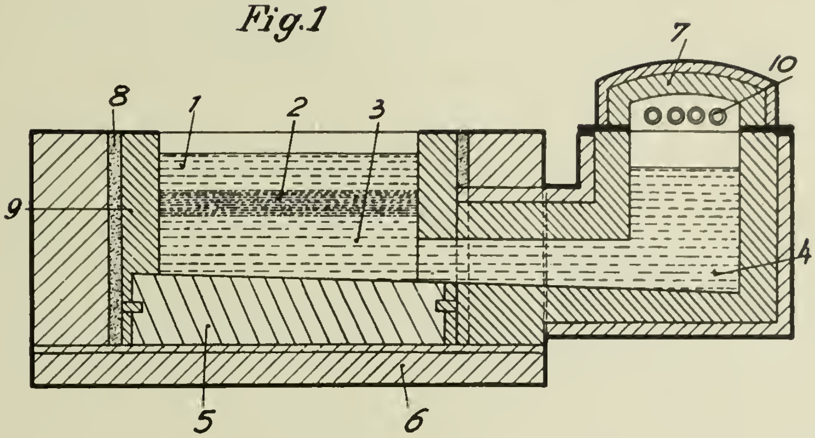
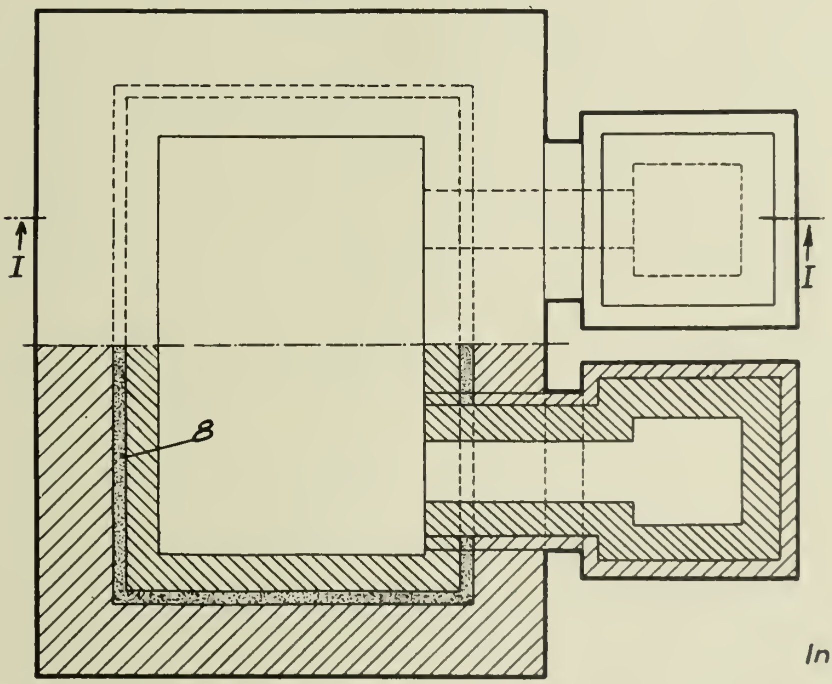


Fig.2



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Agent

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ALIEN PROPERTY CUSTODIAN

BATH FOR THE ANODIC OXYDATION OF ALUMINIUM AND ITS ALLOYS FOR OBTAINING VERY HARD AND TOUGH FILMS

Antonio Sassetti and Carlo Sonnino, Milan, Italy; vested in the Alien Property Custodian

No Drawing. Application filed December 11, 1940

It is known that in the electro-chemical processes of anodic deposition and oxydation it is of outstanding importance to employ organic substances and colloids, which provide improved eveness in the deposition and film formation, and determine special characteristics in said films. In the specific case of oxydation of aluminium the obtention of a very hard film of oxyde, resisting to the action of chemical agents is desired.

The aluminium oxyde which would most satisfactorily correspond to those physical-chemical characteristics is the crystalline oxyde called corundum, having a hardness corresponding to 9 in Mohs' scale. The process according to the invention has the object of obtaining particularly hard and wear-proof films on pure aluminium and its usual alloys, so that such hardness, which can be measured by a diamond sclerometer, be the highest obtainable, the oxyde film possessing, however, all the characteristics which might be required by the different uses of said objects.

For sake of accuracy, the films may be subdivided into the following types:

Type 1.—A very hard film, with limited flexibility, suitable for prevent blocking of fittings, bolts, and any other threaded pieces made of aluminium and its alloys, which film may possess a considerable porosity which allows to color the same by absorption of coloring solutions, for colored objects to be subjected to wearing or rubbing.

Type 2.—A soft, but very porous and flexible film, such as to allow molding of already oxydised pieces or forming a white or colored pigment in the same film to give lacquered-like appearance to the objects, while retaining, however, the characteristics of the anodic film.

Taking the well known aqueous solution of sulphuric acid as the main electrolyte, additions of organic substances have been tested and, through numerous tests, the decisive influence of polyhydric alcohols and chiefly of those methyl-cellulose complexes which are known by the tradename of Tylose has been ascertained; with the presence of the latter complexes, the presence of the above polyhydric alcohols may be dispensed with.

Another product having also a considerable influence on the hardening of the films in question is the so-called Gulac, which is a sub-product of the sulphite cellulose manufacture, cited e. g. in the "Journal of Research of the National Bureau of Standards" of the U. S. Dept. of Commerce, Vol 13, Sept. 1934, No. 3, page 335.

Several examples are described hereinafter, which correspond to the above listed types of films.

Example I (Type 1).—*For very hard, color-absorptive films, with limited flexibility*

15 Kg. of sulphuric acid at 66° Bé. are added to 85 litres of distilled water and, after cooling, 100 g. of Tylose or methylcellulose, are also added.

The bath thus composed has an optimum operation between 15° C and 21° C, giving, however, quite satisfactory films even at 13° C, with a potential from 9 to 15 Volt, the optimum being 12,5 Volt and with a density of current of about 0,8 Ampère per sq. dm. for pure aluminium and rolled or drawn alloys and with a density of current of 1–2 Ampère per sq. dm. for cast alloys. The film is colorless and transparent, vitreous and very hard and yet susceptible of being colored by dipping or other methods with direct coloring agents, or by reaction.

The duration of the oxydizing treatment may be from 20′ to 1 hour and can give films up to 0,06 mm thick. The hardness is surprising and the values for the different alloys in grams of load on the diamond point required to scratch the oxyde film down to the underlying metal are the following:

	Film obtained by the present process	Maximum of other processes
	Grams	*Grams*
Cast anticorodal	246	210
Drawn anticorodal bar	227	186
Semi-raw aluminium sheet	184	150
Rolled avional	137	100
Rolled Duraluminium	111	85

It is evident that the results are most satisfactory and afford the advantage of allowing to color films of even exceptional hardness, which heretofore had to be left with their natural color.

Example II (Type 1.)—*For very hard films, with comparatively limited porosity*

15 Kg. of sulphuric acid at 66° Bé. are added to 85 litres of distilled water and, after cooling, 2–3 Kg. of a polyhydric alcohol, preferably glucose, and 0.5 Kg. of Gulac are added.

The bath thus composed provides optimum operation at temperatures from 15° C to 19° C, quite satisfactory films being obtained, however, even at 13° C, with a potential from 10 to 15 volts and a density of current of about 0.8 ampère per sq. dm. for pure aluminium and rolled and drawn

alloys, and a density of current of ½ ampère per sq. dm. for cast alloys. The film is colorless, transparent and vitreous and gets still harder after immersion in water at 80–85° C for 10–20 minutes. The duration of the oxydizing treatment may be from 20′ to 1 hour, giving a thickness up to 0,06. The hardness is exceedingly high and is listed in the following table, which includes the results obtained with different alloys and pure aluminium. The second column shows the maximum results obtained by the other processes used heretofore.

The values are given in grams of load on the diamond point required to scratch the oxyde film down to the underlying metal.

	Film obtained by the present process	Maximum of other processes
	Grams	*Grams*
Cast anticorodal	248	210
Drawn anticorodal bar	226	186
Semi-raw aluminium sbeet	188	150
Rolled avional	136	100
Rolled Duraluminium	110	85

The influence of the addition of Gulac or polyhydric alcohols is evident; Gulac, however, has an outstanding influence on the result, as the mere addition of polyhydric alcohols, though it gives better results than other processes, does not reach the above figures which represent the average of many tests.

EXAMPLE III (TYPE 1).—*For hard porous layers to be coloured*

20–22 Kg. of sulphuric acid at 66° Bé are added to 80/78 litres of distilled water and, after cooling, 1–1,5 Kg. of a polyhydric alcohol, preferably glucose, and 1 Kg. of Gulac are added. The bath thus composed operates the best at a temperature between 17° and 23° C., giving most satisfactory films even at 16° C., with a potential from 12 to 15 volts and a density of current of 0,9 ampères per sq. dm. for pure aluminium and drawn and rolled alloys, and a density of current of 1-2 ampères per sq. dm. for cast alloys.

The film is colorless and transparent, very hard and capable of being colored by immersion or other system by direct coloring agent or by reaction. The hardness is still decisively higher than with similar coloring processes.

EXAMPLE IV (TYPE 1).—*For films for flexible objects or objects to be molded*

30 Kg. of sulphuric acid at 66° Bé are added to 70 litres of distilled water and, after cooling, 120–150 grams of methyl-cellulose or Tylose are added. Operation requires 12 volts and 0,8 ampères per sq. dm. for aluminium or rolled or drawn alloys, and 1-2 ampères per sq. dm. for cast alloys, between 18° and 23° C. according to whether absorption of a dyestuff or pigment is desired.

The hardness figures, considerably lower and slightly different for various alloys are still superior to those obtained by other processes; for aluminium, for instance, the load is still 100 grams with the present process, while it is only 80 grams with other processes.

EXAMPLE V (TYPE 2).—*For relatively scarcely hard but porous film for flexible objects or objects to be moulded*

30 Kg. of sulphuric acid at 66° Bé are added to 70 litres of distilled water and, after cooling, 3 kg. of a polyhydric alcohol and 2 kg. of Gulac are added.

Operation is carried out with 12 volts and 0,8 ampères per sq. dm. for rolled or drawn aluminium or alloys and with 1–2 ampères per sq. dm. for cast alloys, from 18° and 23° C. according to whether dyestuff or pigment is to be absorbed.

The hardness figures, considerably lower and slightly different for various alloys, are still superior to those obtained by other processes; for aluminium, for instance, the load is still 100 grams with the present process, while it is only 80 grams with other processes.

CARLO SONNINO.
ANTONIO SASSETTI.

Published May 18, 1943

Serial No. 369,684

ALIEN PROPERTY CUSTODIAN

DEVICE FOR THE TIGHT PROTECTION OF THE MEMBRANE OF LOUDSPEAKERS AND MICROPHONES FROM ABNORMAL AND EVEN CONSIDERABLE HIGH AND LOW PRESSION

Giovanni Geloso, Milan, Italy; vested in the Alien Property Custodian

Application filed December 11, 1940

Among many cases where microphones are used there are such most important ones where the apparatus becomes periodically and more or less suddenly subjected to pression, which is even considerably higher or lower than the usually working atmospheric pression. This happens, e. g. where microphones and loudspeakers fixed on the cover of submarines are concerned which in deep immersion may be subjected to very high pression to the extent of 10 atmospheres and more; this occurs also where microphones and loudspeakers for employment near heavy artillery weapons are concerned, in the closeness of which the atmosphere is shattered by waves of pression and depression of considerable amplitude at the moment of firing. The said strains no acoustic membrane can resist, all the more, as for the function which this membrane is to carry out, it cannot present but a very limited resistance.

In practice we try to remedy the described inconvenience by putting the device in a resistant envelope which is provided with a strong cover which gets tightly fixed when the said circumstances are about to occur (in case of submarines), or by getting the wave of pression to arrive on both sides of the membrane simultaneously (in case of guns); but in the first case the operations for closing the lid require a certain amount of time which is not always at our disposal, and in the second case the device proves mostly to be inefficacious.

The present invention has for its subject a device for the protection of the membrane of loudspeakers and microphones, which is automatically protecting the membrane from the said considerable variations of pression, when they are about to occur and which automatically allows it to continue in its normal efficiency when the normal pression is coming back.

Substantially, the device according to the invention consists of a second membrane, which is tightly fixed to the mouthpiece of the loudspeakers or of the microphone, but vibrating in such a way as to transmit to or from the membrane of the latter the sound waves that it is receiving or transmitting, and in connection with the said second membrane—on that side of it to which it is bending by action of the abnormal high and low pression which is to be made inoffensive—it consists of a thrust bearing lattice wall against which it is resting or fixed because of its bend during the entire length of the said high or low pression.

Lest the membrane is disturbed during its normal work by the said lattice wall the deflection of the concavity of the latter is larger than the maximum deflection that the membrane is presenting for the usual most intense sounds; but it is smaller that the deflection of the incurvation corresponding to the limit of elasticity of the membrane, and that is so, in order that the membrane might detach itself from the thrust bearing wall by its own elasticity and occupy once more its normal working position.

Owing to this structure of the thrust bearing wall the sound waves may reach the sonorous membrane of the microphone by passing through the gaps of the lattice (or vice versa in case of loudspeakers), while on the other hand the framework of the lattice, against which the auxiliary membrane is resting in the described abnormal conditions, is dividing its area into a large amount of small areas, each of which must resist a proportional fraction only of the total thrust that is exercised by the abnormal pression upon the whole area of the membrane.

According to another feature of the invention, which is relating to the first, the area of each gap of the lattice wall is designed in such a way that the operating abnormal pression exerts a thrust upon it which is lower than that which the corresponding part of the membrane is able to resist elastically by its own resistance, while the thrust bearing wall is so robust as to resist the entirety of the said thrusts exerted by the abnormal pression on the whole extension of the membrane.

When the formation of either excessive high pression or of excessive low pression only is designed, the thrust bearing wall may be only one which is placed on that side of the auxiliary membrane toward which it is bending, i. e. it presents the convexity; when, on the other hand, the formation of both excessive high and low pression is designed, the auxiliary membrane is provided with a thrust bearing wall on every side, making it thus possible for the membrane to bend in both directions.

With a view of facilitating clear and thorough comprehension of the invention two examples of realization of the same are illustrated in the attached drawings. In detail represent:

Fig. 1 the first example seen in diametrical section;

Fig. 2 the second example seen in analogous fragmentary section;

Fig. 3 a fragmentary frontal view of the thrust bearing wall;

Fig. 4 an enlargement of a detail of the latter.

In the example of Fig. 1, designed for the case of excessive high pression only the membrane A of the loudspeaker or microphone is fixed with its framework B and with the electric set C in a robust envelope D and to the mouth of same the device according to invention is fastened tightly by means of packing *a*, the device which consists of an auxiliary membrane E and of a concave thrust bearing wall F which is placed on the rear of the membrane. This device is held in position by a ring G which is fixed to the envelope D by means of the flanges *b*, *c* and bolts *d* to which may also be fixed the customary mouthpiece H of the apparatus. Before the membrane A a simple mechanical network guard of wire J is fixed in the mouthpiece.

As we already pointed out is the wall F lattice-shaped. In the illustrated case the latter is formed by a quantity of gaps *f* which are crossing the wall itself. When the amplitude of these gaps is excessive as compared with the designed excessive high pression, i. e. when it is such that the thrust on that part of the membrane which is corresponding to each gap is exceeding thc maximum load admitted for it, this amplitude is again subdivided into parts by means of a cross wire L which is fixed between the wall and the membrane and brazed to the wall itself, as illustrated in Fig. 4.

In this case the thrust due to the excessive high pression is distributed in many elementar thrusts on the membrane, which are proportional to the areas of the gaps of the cross wire, which thrusts are so small that every element of the membrane is quite able to resist them; these thrusts are then totalized along each lattice of the cross wire, a lattice which in spite of being of limited dimensions is still quite in a position to support them without permanent deformation; and, finally, the thrust totalized by the cross wire are transmitted by it to the wall which supports with its thickness and with possible ribs M with which it can be provided, the total thrust operating upon the whole area of the membrane without prejudice.

In the upper part of Fig. 1 the auxiliary membrane E is in its usual free position, while in the lower part of the same figure it is in the position which it is occupying under the action of the abnormal high pression, i. e. it is adhering to wall F. In the cavity between the grid J and the membrane E is also preferably fixed a diaphragm with concentric spaced rings N which is able to avoid that the membrane E might become deteriorated through the grid itself. In the central part of this diaphragm is also preferably designed an adjustable plug P which is made resting or pressing against the membrane E in order to avoid that this makes parasitary vibrations by its own movement, not impeding, however, the transmission of sounds to or from the membrane A of the loudspeaker or microphone.

In the example of Fig. 2 the case of a loudspeaker or microphone is designed which is able to resist both excessive high and low pression. In this case, there is besides the wall F behind the membrane E also an analogous wall F′ designed before it, so that the membrane may find a thrust bearing site to whichever part it is bending. The wall F′ may also not be provided with ribs as the excessive low pression can reach at its highest the value of an atmosphere in contrast with the excessive high pression which can reach 10 atmospheres and more.

We would emphasize that the device, besides that it protects the membrane of the loudspeaker or microphone from the feared excessive high or low pression has also the advantage of presenting a water-tight wall, so that the apparatus may be immersed into fluid without danger of being deteriorated in some way.

It is obvious, and expressly emphasized, that although the illustrated and described examples present already excellent characteristics of structure and work, these are not limiting in any way the scope of the invention, i. e. that also any other form of execution adhering to the aforesaid concept of the invention falls into the province of and is protected by the present sole rights.

GIOVANNI GELOSO.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

G. GELOSO

DEVICE FOR THE TIGHT PROTECTION OF THE MEMBRANE OF LOUDSPEAKERS AND MICROPHONES FROM ABNORMAL AND EVEN CONSIDERABLE HIGH AND LOW PRESSION

Filed Dec. 11, 1940

Serial No. 369,684

Fig. 1.

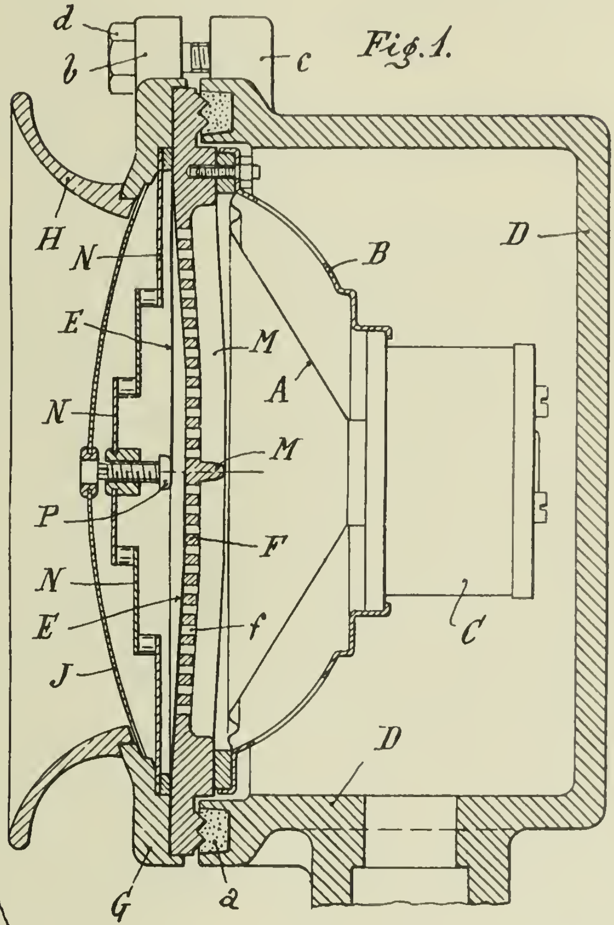


Fig. 2.

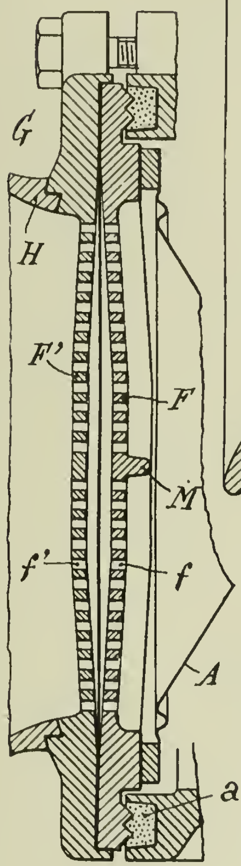


Fig. 3.

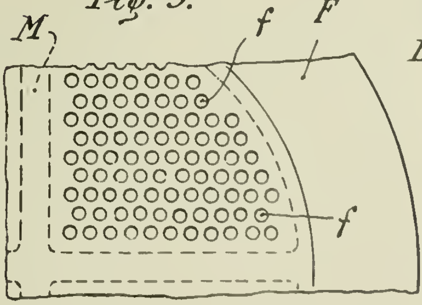
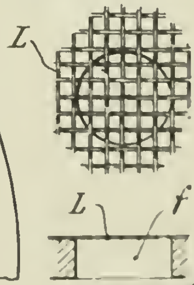


Fig. 4.



Inventor,

G. Geloso

By: Glascock Downing & Seebold

Published May 18, 1943

Serial No. 371,844

ALIEN PROPERTY CUSTODIAN

DEVICE FOR CONTROLLING POWER CIRCUITS

Fritz Kesselring, Berlin-Frohnau, and Wilhelm Puttfarcken, Berlin-Spandau, Germany; vested in the Alien Property Custodian

Application filed December 26, 1940

This invention relates to a device for controlling power circuits in which instead of the usual power circuit breaker a rapidly varying resistor is employed in the circuit to be interrupted. It has been found that it is necessary to displace this resistor with a very high speed, particularly when interrupting overloads. To this end, the movable part of the variable resistor is provided according to the invention with a drive which displaces it under a sudden blow or impact. The resistor is preferably designed in the form of a resistor with a sliding contact.

To operate the device the movable part of the variable resistor may be coupled, for instance, with a movable mass. In this case the material may be stressed by the impact approximately up to the limit of permanent deformations in order to attain as high an acceleration as possible of the part to be moved. The driving mass consists preferably of a revolving body which is to be brought into engagement with the movable part of the variable resistor. However, the mass may also be associated with a revolving endless flexible member, such as, for instance, with a band or a chain. The mass itself may be designed as a flexible member or the flexible member may be employed as a support for the driving mass. If the stroke of the variable resistor is short its movable part may also be driven by a mass moved in the direction of displacement of the movable part or perpendicularly thereto and whose path along which it moves is straight at least in the region in which the mass acts upon the movable part of the resistor. The control movement may be derived, for instance, by a wedge action from a transverse movement of the driving mass.

To connect the resistor with the drive also a coupling with a short travel and a small mass of its driven part may be employed. This has the advantage that no time is lost during the coupling before the resistor has been displaced.

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form.

In Fig. 1 the variable resistor consists of two resistance bodies *w1*, *w2* between which a contact *s* is rotatably mounted. Fig. 2 is a sectional view taken along the line A—B of Fig. 1 and represents schematically the form and the arrangement of the resistance bodies and contact and their connection with the circuit *xy* to be interrupted. The resistance bodies are mounted in the housing *g* of the device and are under the influence of the springs *h* which establish the contact pressure necessary between the resistance bodies and the contact *s*. The contact is mounted on a vertical shaft *a* provided at the upper end thereof with two disks *k1*, *k2* which form a part of a friction coupling. A flywheel mass *m* suspended from the shaft *d* rotates above these disks and is driven by a motor not shown. The friction surfaces cooperating with the coupling disks *k1*, *k2* are arranged beneath the mass *m* and beneath a ring *e* secured to the mass. If the lower end of the shaft *a* is raised by means of a toggle joint lever *c* the coupling disks come into engagement with the friction surfaces of the flywheel mass and are driven by friction. The toggle joint lever *c* is actuated through a control lever *n* by means of an electromagnet (not shown).

The contact *s* does not make a complete revolution but performs only a portion of a revolution until it comes into the end position shown in dotted lines. The movement may be braked by a disk brake secured also to the shaft *a*. The disks *b1* and *b2* are designed in the form of helical surfaces in such a manner that at the beginning of the movement of the contact there is a clearance between the braking surfaces carried by the rings *i* and *l* and the disks. At the end of the movement the disks come into engagement with the braking surfaces so that a braking occurs. To return the contact to its initial position a spring *f* is employed secured to the shaft *a*.

Fig. 3 shows schematically another form of the invention in which the movable part *s* of the variable resistor is driven by a revolving band *o* whose mass is so chosen that it displaces the contact *s* under a sudden blow after the latter has been connected therewith. This connection is brought about by friction in the manner that the eccentric *p* presses the band o against the back of the contact *s* or its support *t*.

If a rigid coupling serves to connect the movable part with its drive, known devices are preferably provided to facilitate the engagement of the coupling in order that the latter does not break under a sudden blow. If a revolving chain is, for instance, employed for the drive a rigid coupling member, for instance, a hook or a pin which establishes the connection with the movable part of the variable resistor may be brought before coming into engagement into a favorable position with respect to the links of the chain by means of a guide device, for instance, by means of an auxiliary chain or the like.

Also elastic members which damp the shocks occurring when coupling may be employed in the drive.

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WILHELM PUTTFARCKEN.

PUBLISHED	F. KESSELRING ET AL	Serial No.
MAY 18, 1943.	DEVICE FOR CONTROLLING POWER CIRCUITS	371,844
BY A. P. C.	Filed Dec. 26, 1940	

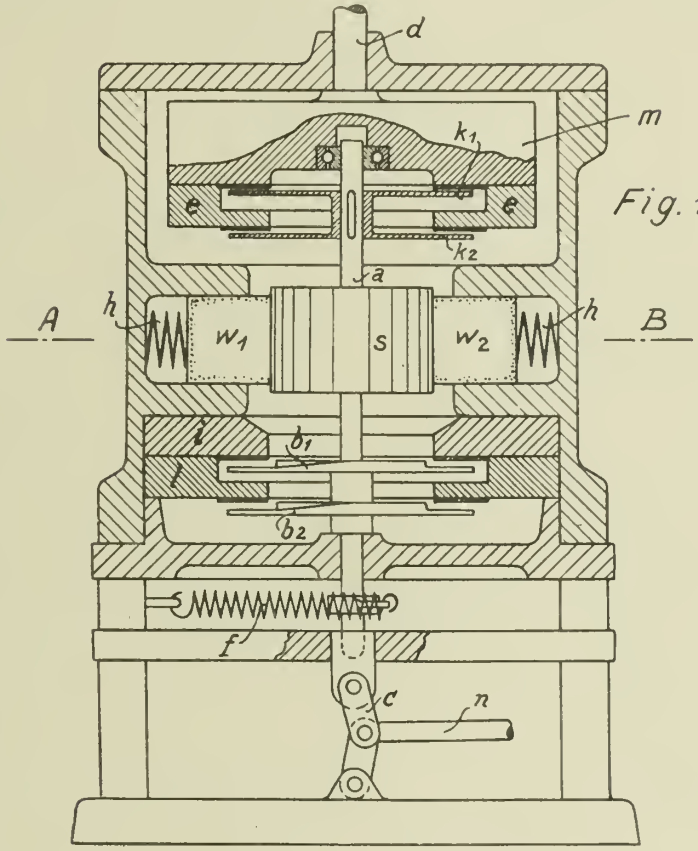


Fig. 1

Fig. 2

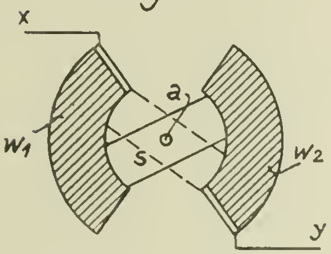
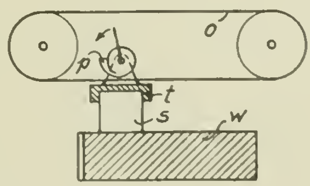


Fig. 3



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ALIEN PROPERTY CUSTODIAN

PRESSURE LUBRICATING SYSTEM

Gustav Nemetz, Vienna, Germany; vested in the Alien Property Custodian

Application filed January 4, 1941

The present invention relates to pressure lubricating systems in which the lubricant supplied by a source of pressure is distributed by means of a divisional feeder to a plurality of points of lubrication all of which are under an equal pressure. Divisional feeders of the kind referred to are for example disclosed in U. S. Patents No. 2,027,171 or No. 2,007,797. In such systems, a conduit connects the source of pressure with the divisional feeder which is located in proximity to the points of lubrication in order to reduce the length of conduits required. In each conduit leading from the divisional feeder to a point of lubrication, preferably directly at the latter, is inserted a check valve opening toward the point of lubrication. The purpose of the said check valves is to seal the conduits against any reaction from the points of lubrication. In a lubricating system of this kind having e. g. four points of lubrication it is, therefore, necessary to provide four check valves whereby the initial outlay and the cost of maintenance for the system are increased.

The object of the present invention is to simplify and cheapen lubricating systems of this kind and, above all, to save the supervision of numerous check valves without impairing the safety of operation.

The accompanying drawing shows in Figs. 1 and 2 by way of example diagrammatic views partly in section of embodiments of the invention.

In the system according to Fig. 1 the lubricant is supplied by a pump **1** of the usual kind which is operated in a known manner by a suitable source of power by means of an oscillating lever **2**. A conduit **3** connects the pump **1** with a divisional feeder **4** the construction of which, as mentioned above, corresponds e. g. to that disclosed in U. S. Patent No. 2,027,171 or No. 2,007,797, so that a detailed description may be dispensed with. In the conduit **3** immediately before the divisional feeder **4** is arranged a check valve which is adapted to open in the direction of the divisional feeder, thus allowing the lubricant supplied by the source of pressure to pass whereas it seals the passage toward the source of pressure. In the example shown in Fig. 1, the check valve consists of a back-pressure valve of a design known per se, the valve cone **5** of which is pressed against its seat **7** by the power of a helical spring **6**. Conduits **8**, **9**, **10**, **11** lead from the divisional feeder to the points of lubrication **8′**, **9′**, **10′**, **11′**.

During operation, the conduit **3** is always completely filled with lubricant. The amount of lubricant supplied by the pump enters the divisional feeder **4** after passing the check valve. The source of pressure is, therefore, positively protected by the check valve in the conduit **3** from any detrimental actions of the medium at the points of lubrication, such as compressed air or steam.

In Fig. 2 is shown a similar embodiment of the invention comprising, however, a known diaphragm type overflow valve as an oil check valve. Said diaphragm type overflow valve consists of a valve cone **12** fastened to a diaphragm **13**. The diaphragm **13** seals the space **14** within the valve casing to which the lubricant is supplied under pressure by the pump **1**. The valve cone **12** is loaded over the diaphragm **13** from the outside by a spring **15** tending to keep said cone in the closed position. When the lubricant is forced into the space **14** underneath the diaphragm, the valve cone **12** is lifted off its seat against the action of the spring, the lubricant flowing through the opening **16** directly into the divisional feeder **4** by which it is distributed to the points of lubrications **8′**, **9′**, **10′**, **11′** which are under a uniform pressure.

If, in addition, the known check valves were arranged between each point of lubrication and the divisional feeder, the former would, in fact, also protect the distributing pistons of the divisional feeder from the action of the counter-pressures prevailing at the points of lubrication. This, however, is not necessary with a system embodying the invention according to Figs. 1 or 2. The known check valves are omitted since, as is presupposed with a lubricating system according to the invention, a uniform pressure prevails at all the points of lubrication such as at the points of lubrication located on the circumference of a section of a working cylinder, and the divisional feeder may be safely exposed to the counter-pressure of the points of lubrication without the least danger of the accurate and proper operation being in any way interfered with. In accordance with the present invention, a single check valve, therefore, suffices to ensure a perfect operation of the pressure lubricating system.

GUSTAV NEMETZ.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

G. NEMETZ
PRESSURE LUBRICATING SYSTEM
Filed Jan. 4, 1941

Serial No.
373,101

Fig. 1

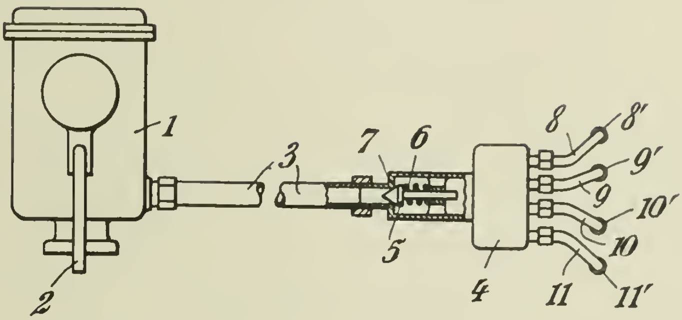
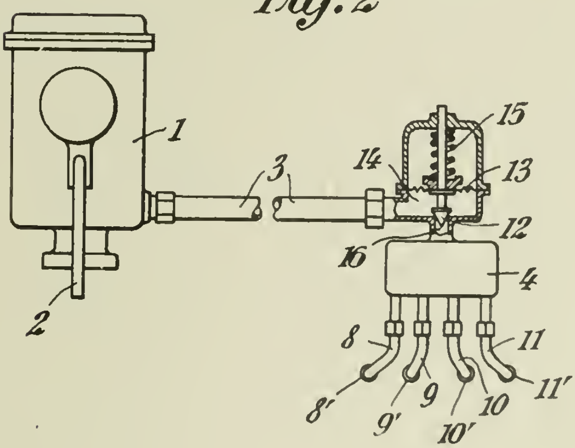


Fig. 2



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BY Karl A. Mayr
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ALIEN PROPERTY CUSTODIAN

INSULATED WIRES AND CABLES

Adolf Benischek, Ludwigshafen-on-Rhine, Germany; vested in the Alien Property Custodian

Application filed January 8, 1941

The present invention relates to insulated wires and cables, the electrical insulation of which comprises a priming layer of an elastic high-melting or infusible organic insulating material directly applied to the metallic conductor and a preferably thicker and firmly coherent coating of an organic thermoplastic insulating material upon this priming layer. Further protective coatings may be provided, if desired.

The priming layer to be applied to the metallic conductor may be prepared, in particular, from linear high-molecular weight film-forming polycondensation products especially from superpolyamides or superpolyurethanes, i. e. high-molecular weight polyamides or polyurethanes, or furthermore from resinous hardenable reaction products of soluble condensation products of aliphatic dicarboxylic acids containing at least 4 carbon atoms, as for example succinic or adipic acid, and polyhydric alcohols on the one hand and of soluble condensation products of a phenol and an aldehyde or a urea and an aldehyde or of the initial materials of the said condensation products in the first stage of condensation on the other hand, the said resinous reaction products being hardened by heat, whereby they become unfusible.

Superpolyamides may be prepared, as it is known, by heating an $\omega.\omega'$-dicarboxylic acid, as for example adipic with an $\omega.\omega'$-diamine, as for example hexamethylene diamine, or an ω-amino-carboxylic acid having at least six carbon atoms, as for example ϵ-amino capronic acid, or amide-forming derivatives thereof, or also mixtures of the said substances. Superpolyurethanes are preferably prepared by reacting a diisocyanate; as for example hexamethylene diisocyanate, with a glycol, as for example 1.4-butylene glycol. The superpolyamides and superpolyurethanes possess very high softening or melting points of for example up to 260° C. Most of them yield melts having a low viscosity and which can be worked in the same manner as molten lead, as for example by means of the usual machines for covering cables with lead, which workability is of high technical advantage.

The second coating to be applied to the said priming layer may consist, for example, of polyvinyl compounds, cellulose derivatives or rubber. These materials are preferably applied by means of an extruding press or of a cable sheeting machine. They may also be applied by winding them on in the form of ribbons and welding the overlapping parts of the ribbons, for example by heating.

The priming coating, therefore, must be made of a high-melting or unfusible material, lest it should be deteriorated by the heat employed in applying the second layer.

The electrical conductors thus insulated may yet be provided with any type of protective coatings, for example spun-on, braided-on or wound-on textile envelopes, tightly fitting coatings of bitumen or similar materials, metallic armourings or reinforcements of bands or flat or profiled wire.

The insulations in accordance with the present invention are distinguished by an especially high dielectric strength. They are, even when the second layer is made from a soft material, very resistant in contrast to those hitherto used in the cable industry. Even if then the second coating should be dislodged by pressure and or higher temperatures, the priming coating will still afford an efficient insulation and prevent the cable from being further damaged. Tinning the conductors was hitherto necessary when rubber was used as an insulation material, since the sulphur needed for the vulcanization of the rubber tends to attack other metals than tin under the vulcanizing conditions. According to the present invention, however, the conductors need no longer be tinned when using rubber as the further insulating material, because the strong priming layer prevents the conductor from being attacked by sulphur.

ADOLF BENISCHEK.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

A. BENISCHEK

INSULATED WIRES AND CABLES

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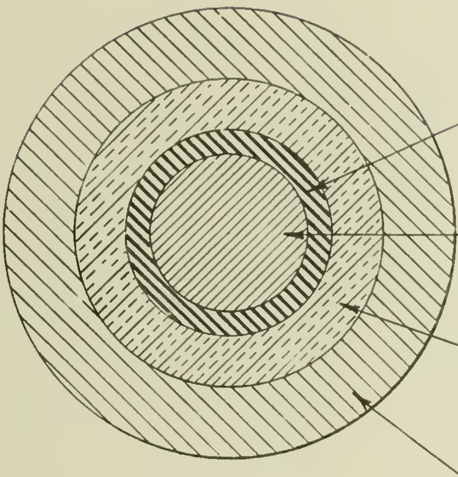


INVENTOR

ADOLF BENISCHEK

BY Hedges and Joslin[?]

HIS ATTORNEYS

Published May 18, 1943

Serial No. 373,780

ALIEN PROPERTY CUSTODIAN

SETTING DEVICE ON MECHANICAL AND ELECTRIC MEASURING INSTRUMENTS

Paul Hildebrand and Artur Metz, Mannheim, Germany; vested in the Alien Property Custodian

Application filed January 9, 1941

In mechanical and electric measuring instruments in which, when a certain maximum or minimum value is attained, a feeding proceeding is released with the aid of a mercury switch tube connected with the hand of the measuring instrument, it is already known to fix the ring-shaped metal tube on a hand shaft, the ring-shaped tube turning in accordance with the hand shaft. Constructions have further become known, in which the ring-shaped tube is arranged separate in front of the work hand of the indicating instrument, a stop pin being provided and the tube being carried along by a catch on the work indicating hand. For adjusting the contact of the mercury ring-shaped tube for contact giving when a certain maximum- or minimum value of the instrument has been attained, the casing of the instrument must be opened. It is then either necessary to hold the extended hand shaft in order to adjust the mercury tube, or the ring-shaped mercury tube itself must be adjusted in order that the stop pin can be adjusted. The circumstance that the protecting case must be opened for the setting is impeding and inconvenient. Further, in arrangements of this type, an accurate adjusting to the desired scale value is extremely difficult and time wasting and cannot be carried out by every one, as it is necessary to open the instrument. According to the invention the setting takes place from the outer side and can be carried out by any one without opening the case.

The invention relates to a setting device on mechanical and electric measuring instruments, in which by means of mercury switch tubes connected with the hand of the measuring instrument a feeding proceeding is disengaged when a certain maximum or minimum value of the measuring value is attained. By the invention the problem is to be solved in an especially suitable manner, to enable the setting of the maximum or minimum values from the outer side of the measuring instrument. According to the invention this is effected thereby, that one or two catch-hands are fixed on the shaft carrying the mercury switch tube so that, when the shaft is held fast, the hands can be adjusted independently the one from the other from the outer side by means of a separate device or by an element accessible from the outer side.

Other features of the invention relate to the additional provision of hands indicating the set value and to a facilitated possibility of providing the seals for the current leads on the mercury switch tube. The cooperation of these two further improvements effects, that measuring instruments equipped with these devices are suitable for the highest demands.

According to the invention two other hands are arranged, axially parallel to the catch-hands but separate from the same, these hands serving for indicating the maximum and minimum value. These hands indicating the set value are within the range of action of the setting lever, and they are shiftable by means of this lever parallel to the catch-hands to any desired point of the scale. Their position can, however, not be altered by the catch pin contrary to the two catch hands. The additional hands are bent at right angles so that their part destined to indicate on the scale moves in front of and over the catch hands so that the adjusted initial value can always be ascertained and read. These hands indicating the set value are preferably fixed on the front fixation plate on the existing bracket, or on a bracket especially provided herefor, that is separate from the shaft, and so that they are resilient.

An other feature of the invention relates to the enlargement of the contact range of the mercury switch tube. This mercury switch tube, as is generally known, serves for establishing a connection between the seal for the current supply and the seal for the current discharge as long as the mercury is in contact with the two seals. As usually the mercury filling amounts to about 180° or fills half the ring-shaped tube, a connection can take place only in this angular position, which means that a connection is always ensured according to the height of the mercury filling related to the degree of angle. In order that the seals may be arranged as desired and in order to further ensure a reliable current connection for the angular oscillations happening in practice, a metal ring connected with a seal is provided according to the invention on the inner circular or ring-shaped wall part of the mercury ring tube corresponding to the angular oscillation. This arrangement presents at the same time the advantage, that the mechanical resistance otherwise occurring at the seals is overcome and thereby the turning moment of the tube becomes considerably more favorable.

Several embodiments of the invention are illustrated in the accompanying drawings, in which

Fig. 1 shows the setting device in side elevation.

Fig. 2 shows the mercury switch tube.

On a shaft b a mercury ring tube a of suitable

shape is fixed or several such mercury ring tubes. On one end of the shaft two catch hands *c* and *d* are mounted so that they can be adjusted independently the one from the other when the shaft *b* is held fast. On the other end of shaft *b* a holding device *e* is mounted, which consists of a disc with abutment pin *t*, said disc adapted to be securely held in its position by a bolt *u* of a disc *g* after this bolt has been pressed inwards. The shaft *b* with the two catch hands *c* and *d*, the mercury ring tube *a*, and the disc *e* and with the necessary current takers is revolvably mounted. The apparatus hand *i* has a catch pin *x* engaging between the two catch hands *c* and *d*. If the apparatus hand *i* moves over one of the set values, the catch pin *x* carries along the catch hand *c* or *d*, whereby the shaft *b* and with the same the mercury ring tube *a* is turned and at the same time the contacts on the mercury ring tube *a* are switched-in or cut out. To alter the switch limit as desired, it is possible to adjust the two catch hands *c* and *d*. This is attained in that the adjusting lever *f* is pressed inwards from the outer side in the direction of the arrow by means of a handle *l*, whereby the holding device is actuated, in that the bolt *u* of disc *g* is pressed against the stop pin of disc *e* so that the shaft *b*, same as the mercury ring tube *a*, can no longer turn. The catch hands *c* and *d* can then be adjusted on the scale as desired. As soon as the adjusting to the desired value has been carried out, the adjusting lever *f* and the disc *g* with its bolt *u* are brought again into the initial position by the action of springs *k* and *z*. The holding device is then actuated by means of a handle *l*, for instance a socket key or set screw.

According to the invention it is further possible, when one or several shafts is or are arranged which carry the mercury ring tubes, to stop these mercury tubes singly or all at the same time in order to actuate the catch hands arranged on one of these shafts. In this instance the holding device may also be provided so that a screw or the like is actuated, and also the actuation of the catch hands *c* and *d* is then effected by other means, such as toothed wheels or the like.

Two hands *m* and *n* indicating the set values are arranged on the bracket *o* in the range of action of the adjusting lever *f* and axially parallel to the catch hands but separated from the same. These hands *m* and *n* may be shifted, parallel to the catch hands *c*, *d* to any point on the scale *s*. The hands *m*, *n* are independent on the catch pin *x*, contrary to the two catch hands *c*, *d*, as this pin *x* cannot shift the hands *m* and *n* out of their position.

The hands *m* and *n* are bent at right angles so that their indicating part moves in front of and over the catch hands *c*, *d* and can act to securely hold the initial or set values. Evidently, the hands for indicating the set value may be fixed on the front fixation plate or on an existing or separate bracket without departing from the inventive idea. This fixation is effected by means of resilient elements so that each one of the two hands can be set or adjusted alone, that is independently the one on the other.

The mercury switch tube *a* of ring-shape, shown in Fig. 2, has a metal ring *p* on its inner ring-shaped wall part, said ring being connected with the outer seal *r*. By turning the mercury ring tube the seal *q* is connected with the seal *r* through the mercury and the metal ring so that contact is produced. The inserted metal ring *p* ensures, even at great angular oscillation at the turning of the ring tube always a permanent connection with the mercury, so that even at great angular oscillation corresponding to the mercury filling always a perfect connection is ensured, and an interruption between the two seals cannot occur even at excessive turning angle of the ring tube.

The knowledge according to the invention to carry out the actuation of the holding and adjusting means from the outer side of the casing includes the possibility, that especially the engaging point may be situated also inside the front wall of glass.

PAUL HILDEBRAND.
ARTUR METZ.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

P. HILDEBRAND ET AL

SETTING DEVICE ON MECHANICAL AND ELECTRIC MEASURING INSTRUMENTS

Filed Jan. 9, 1941

Serial No. 373,780

Fig.1

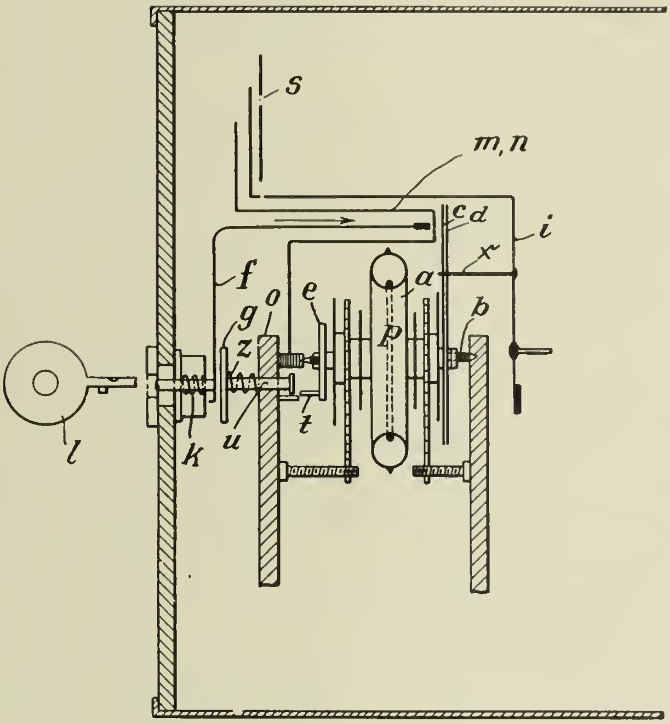
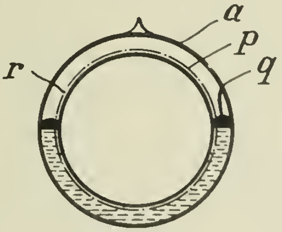


Fig.2



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ALIEN PROPERTY CUSTODIAN

PROCESS FOR OBTAINING COAL PARTICULARLY POOR IN ASH CONTENT

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No Drawing. Application filed January 9, 1941

This invention relates to a process for obtaining coal particularly poor in ash content as required in increasing degree for various industrial purposes, especially as starting material in the production of electrodes.

The efforts made to reduce the ash content of coal to the maximum admissible for these purposes have not been completely successful till now. The usual methods according to which the coal is prepared without considering the different primary ash contents of its structural constituents may be disregarded from the outset, since the application of such methods results at best in ash contents of several percents, even if a very low yield is accepted, whereas the maximum permissible ash content of coal suited for the purposes stated must be far below 1%. It is therefore necessary to carry on the preparation along petrographic principles applying particularly to coal, which involves the elimination of those structural constituents of the coal that disclose per se a materially higher combined ash content, such as fusite containing the secondary epigenetic mineral substance, chiefly pyrite and calcite, and durite containing the secondary epigenetic clay substance, so as to effect an enrichment of the remaining vitrite and clarite portions which contain merely the primary plant ashes.

Various preparation methods have been proposed for this purpose, as the application of the elastic impact for separating the structural constituents, the preparation in liquids possessing high specific gravity, and some flotation processes having a selective effect with respect to the petrography of coal.

All these proposals fail, however, to bring about a sufficient enrichment of vitrite and clarite so as to obtain the desired low ash content.

It is the object of the invention to provide a process for obtaining coal particularly poor in ash content, which satisfies both technical and economic requirements, and this object is attained by subjecting coal of suitable grain size, possibly in the form of a washed coarse-, fine- or finest-grained product, first to one of the known preparation methods relying for instance on treatment in liquids of high specific gravity, trough washing or electrostatic processing, which at least to a certain extent have a petrographically separating effect, and then causing the "refined" coal obtained by this preparation and having already a very low ash content amounting to less than 2% to undergo ordinary flotation, possibly after it has previously been disintegrated if necessary to acquire a grain size required for the complete separation of the structural constituents. The flotation has also a petrographically dissociating effect, since due to the preceding steps of treatment, particularly to disintegration, mineral substance has been superficially exposed on the structural constituents of higher combined ash content, so that they are wetted by water during flotation and do not float up. It has been found that in this way a vitrite-clarite enrichment of approximately 95% with an ash content of below 0.6% can be obtained.

The following examples presented to indicate the application of this invention are merely illustrative and not limitative in character:

Example 1

Preparation of a washed fine coal first in a liquid of high specific gravity (step 1) and then by flotation of the refined coal obtained (step 2)

	First step		Second step	
	Starting coal	Waste	Refined coal	Pure coal
	Per cent	*Per cent*	*Per cent*	*Per cent*
Ash content	3.2	5	1.35	0.55
Vitrinite	50	42	55	79
Clarite	28	26	26	15
Durite	10	14	11	3
Semifusinite	3.5	8	5	1.5
Fusinite	5	4	3	1.5
Bituminous shale	3.5	6	------	------
	100	100	100	100
Vitrite-Clarite	78	76	81	94

From the washed fine coal representing the starting product and having an ash content of 3.2% a refined coal of 1.35% ash content at a vitrite-clarite enrichment of 81% is obtained due to preparation in a liquid of high specific gravity and particularly to the separation of bituminous shale. By subsequent flotation the ash content of the product is reduced to less than 0.6% and simultaneously the vitrite-clarite content increased to 94%. All structural constituents of high primary ash content, as durite, semifusinite and fusinite, are therefore eliminated with the exception of unimportant residual quantities.

Example 2

Preparation of an unwashed fine coal taken from a specimen cut out of a bed in a liquid of high specific gravity (step 1) followed by flotation of the refined coal obtained (step 2)

	First step		Second step	
	Starting coal	Waste	Refined coal	Pure coal
	Per cent	*Per cent*	*Per cent*	*Per cent*
Ash content	10.5	15.9	1.3	0.45
Vitrinite	55		52.5	58
Clarite	30		37	39.5
Durite				
Semifusinite	2.5		2	0.5
Fusinite	2.5		3.5	2
Bituminous shale	2		3.5	
Tailings	8		1.5	
	100		100	100
Vitrite-Clarite	85		89.5	97.5

In this instance, due to the preparation in a liquid of high specific gravity, the ash content of the refined coal amounts to 1.3% at a vitrite-clarite enrichment of 89.5%. Subsequent flotation of the product yielded a pure coal with an ash content of only 0.45% and comprising 97.5% vitrite-clarite, because the original 9% contaminating structural constituents, as durite, semifusinite and fusinite exposed by intermediate disintegration, could be reduced to 2.5%.

Compared with the values obtainable by known processes, a yield of 50% pure coal from washed coal or 40% from raw coal, notwithstanding the considerably higher degree of purity, is remarkably high and clearly indicates the superiority of the new process. Furthermore, the process according to the invention is advantageous also for a subsequent chemical treatment of the concentrates obtained for the purpose of removing additional ash constituents, since the remaining slight ash content, owing to the resulting composition of the mineral substance, is present in an easily decomposable form.

FRIEDRICH LUDWIG KÜHLWEIN.

Published May 18, 1943

Serial No. 374,560

ALIEN PROPERTY CUSTODIAN

ELECTRICAL APPARATUS

Gilles Holst and Johannes Hoekstra, Eindhoven, Holland; vested in the Alien Property Custodian

No Drawing. Application filed January 15, 1941

In electric apparatus such as transformers which are housed in a casing the sealing of this casing is naturally very important, especially if the casing is to be filled with a more or less liquid impregnating material.

Even if careful attention has been given to the sealing of the casing there is always the risk that mechanical damage or repeated heating and cooling of the apparatus, may cause the appearance for example, of small cracks which may lead to leakage.

The invention has for its object to obviate this difficulty by filling the free space between the casing and the electrical apparatus proper with a viscous electrically insulating material which on passing out into the air through leaks in the casing congeals at such a rate that consequently the said leaks are automatically sealed substantially without any loss of insulating material.

The invention offers the advantage that the said risk is avoided and that moreover a less perfect and consequently simpler seal of the casing suffice even from the start.

The insulating material of the invention may be insulating air-drying lacquers, for example on the base of air-drying oil.

By way of example we quote below a composition especially suited for use in carrying out the invention. A mixture of 1 part of collophony and 1 part of dammar resin is heated at a temperature of about 300° C. The greater part of the gaseous products thus produced is separated by distillation and the mixture has added to it so much zinc oxide as is needed to neutralise the free acids. The molten resin mixture thus obtained has added to it a mixture of $4\frac{1}{2}$ parts of wood oil and $1\frac{1}{2}$ part of linseed oil and it is then maintained at a temperature of 270° C. for about half an hour, following by cooling.

In order that the invention may be more clearly understood it may be observed that automatic sealing is to be understood to meet the requirement that the viscous material, if passing out into air at 200° C. under a hydrostatic pressure of 4 grs. per square cm. through an aperture having a length of 1 cm. and a diameter of about 0.25 mm. this discharge occurs substantially without any loss of insulating material.

The invention is particularly important in connection with transformers which are used for generating very high voltages since, as is well-known, a liquid or semi-liquid impregnating material is generally more resistant against such high voltage in the course of time than a solid or a more or less brittle material.

When carrying the invention into practice the form of wire insulation used in the electrical apparatus is to be taken into account and liquids, particularly aromatic liquids, having a high dissolving power should generally be avoided if the electrical apparatus contains the usual forms of enamel wire.

GILLES HOLST.
JOHANNES HOEKSTRA.

Published May 18, 1943

Serial No. 374,599

ALIEN PROPERTY CUSTODIAN

SWITCHING DEVICE

Ottmar Conradty, Rothenbach on the Pegnitz, and Hans Zöllner, Lauf on the Pegnitz, Germany; vested in the Alien Property Custodian

Application filed January 15, 1941

This invention relates to switching devices or controllers and has particular reference to drum type switches.

It is an object of the present invention to provide a switching device which avoids the defects of the known devices having metal contact pieces on the drum or controller cylinder.

A special object of the present invention is to provide contact pieces of a material ensuring a reliable switching action and preventing the formation of sparks and other phenomenons inherent to controllers having metal contact pieces.

With these and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Fig. 1 is an axial section of a controller cylinder having the invention applied thereto.

Fig. 2 is a section on line A—A of Fig. 1, showing the parts in their switched-in position.

Fig. 3 is a similar section, showing the parts in their switched-off position.

Fig. 4 is an end elevation showing a modification in the switched-in position of the parts.

Fig. 5 is a similar elevation showing the parts in their switched-off position.

Fig. 6 is an end elevation of another modification, switched-in and

Fig. 7 is a similar elevation in switched-off position of the parts.

Similar characters of reference denote similar parts in the different views.

According to the present invention, the active contact pieces of the drum type switch consist of artificial carbon or graphite material. The use of such artificial carbon or graphite material offers considerable advantages over metal contacts, since the carbon material is not liable to evaporation and burning off as a result of the breaking sparks occurring in switching devices of the kind referred to. Therefore, no molten beads are produced as with metal contacts and the carbon contacts do not require permanent attendance as by greasing. Also their duration of life exceeds that of metal contacts. Furthermore, the oxide layers produced on the surface of metal contacts of drum type switches owing to the influence of the atmosphere which interfere with the passage of current do not occur with our novel carbon contacts.

In the practice of our invention the switching drum is composed of a plurality of contact disks of carbon or graphite material arranged in series with intermediate insulating parts on a common shaft, from which the carbon disks are insulated.

Referring now to the drawings in greater detail and first to Figs. 1, 2 and 3, it will be noted that a plurality of carbon disks SK and intermediate insulating and spacer disks J are mounted on a sleeve JW of insulating material surrounding the drum shaft W. The shaft may be operated by a hand wheel B or by an operating lever. As best seen from Figs. 2 and 3, the carbon disks SK are capable of engaging stationary contacts K (Fig. 2) or, by turning the shaft through an angle of 90°, may be removed from said contacts, thus breaking the passage of current from or to said contacts K (Fig. 3). To this end the contact disks are made with an oval shape as seen from Figs. 2 and 3, or in other words, the disks are circular plates with partly flattened circumferential faces. As indicated in Figs. 2 and 3, the disks SK may consist of two parts each, which at their abutting faces may be in direct electrical contact or provided with intermediate insulating layers F, depending upon the switching operations to be performed by the device. Irrespective of its conductive or insulating character, the intermediate layer F will include a cement for holding the two carbon parts together.

By way of alternative, the contact disks may consist of four or more parts SK_1, SK_2, SK_3, SK_4, as shown in Figs. 4 and 5, the parts SK_1, SK_2, SK_3, SK_4, being electrically connected or insulated from one another at F, for engagement with, or disengagement from, stationary contacts K_1, K_2, K_3, K_4. To this end, the contact disks are formed with cam portions and intermediate recesses corresponding in number to the number of contact points, as shown in Figs. 4 and 5.

Referring now to Figs. 6 and 7, it will be noted that the carbon disk SKN in this case is in the form of an eccentric cam disk which may be required, for instance, to effect a rapid interruption of the current between the stationary contacts K_1, K_2, by rotation of the disk in the direction of the arrow.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

OTTMAR CONRADTY.
HANS ZÖLLNER.

[illegible]

PUBLISHED

MAY 18, 1943.

BY A. P. C.

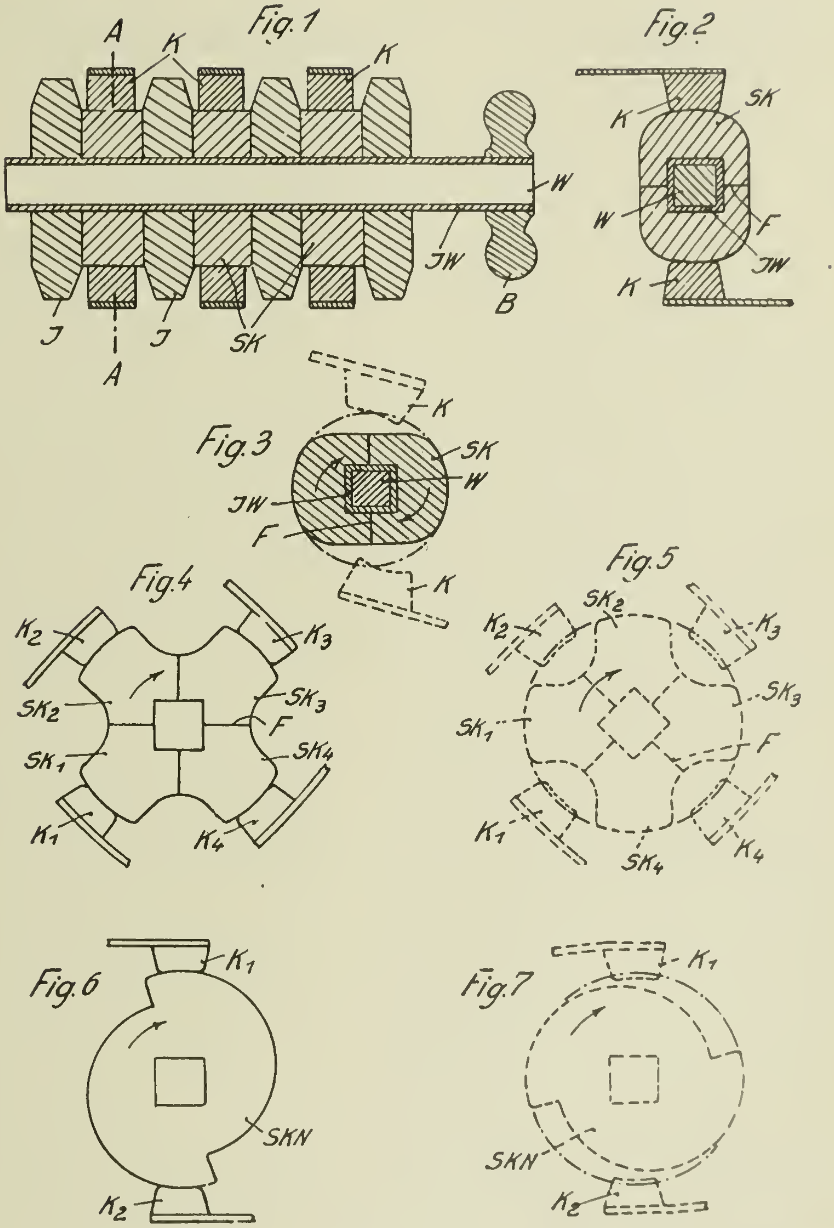
O. CONRADTY ET AL

SWITCHING DEVICE

Filed Jan. 15, 1941

Serial No.

374,599



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By Young, Emery & Thompson

Attorneys

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ALIEN PROPERTY CUSTODIAN

CARBON COLLECTOR

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Application filed January 15, 1941

This invention relates to a collector or commutator for electrical machines or apparatus comprising collector bars of carbon material.

Normally, collectors having segments of artificial carbon material are constructed similar to the conventional copper collectors, making the components, such as segments, insulating sheets, sleeves, clamping plates etc. in separate operations, assembling the parts and then connecting the same to a unitary body by screwing, clamping, shrinking or other mechanical means.

It is an important object of the present invention to avoid mechanical clamping means for holding the segments together, and to produce self-supporting collectors having segments of artificial carbon material which form a closed integral ring without requiring any additional clamping parts.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 is a perspective view showing a collector ring having the invention applied thereto, including a clamping ring used in its manufacture.

Fig. 2 is a schematic, fragmentary cross section, on an enlarged scale.

Fig. 3 is a perspective view of a modification.

Fig. 4 is a mould for use in the production of the collector ring shown in Fig. 3.

Figs. 5 and 6 are perspective views illustrating a step in the manufacture of our novel carbon collectors from integrally pressed carbon bodies.

Figs. 7 and 8 are perspective views showing the manufacture of the collectors in the form of longer rods or truncated cones.

Similar characters of reference denote similar parts in the different views.

According to an important feature of our invention, and as here shown, the insulating separating layers between the carbon segments comprise a binder which after assemblage of the parts is somewhat mobile, and the carbon segments are exposed to a radial pressure sufficient to cause penetration of the binder into the pores of the carbon segments. Thus, after solidification of the binder the carbon segments and insulating separating layers are held firmly together in the form of an integral mechanical body, while the carbon segments are electrically insulated from each other.

Referring now to the drawings in greater detail, and first to Fig. 1, it will be noted that a plurality of carbon segments 1 together with their intermediate insulating layers 2 are held together by a clip 3, a considerable radial pressure (arrows *a*) being exerted upon the parts by means of screws 4 in the clip 3. Under action of the tangential pressure (arrows *b*) thereby produced upon the insulating material 2 which is still in a somewhat soft state, the binder therein, which is indicated at 5 in Fig. 2 and is in a somewhat mobile, plastic or liquid state at that time, is squeezed out and caused to penetrate into the pores of the adjacent carbon segments 1. The collector body 1, 2 with the clamp 3 is left untouched for a length of time sufficient to allow the binder 5 to set, and then removed from the clamp 3, forming now a rigid, self-supporting body which may be used for the construction of an electrical machine in any suitable manner.

Referring now to Figs. 3 and 4, it will be seen that the carbon segments and insulating intermediate layers 2 are shaped to form a tubular truncated cone body which after its assemblage may be forced into a mould 15. The axial pressure (arrow *c*) owing to the conical shape is transformed into a radial pressure (arrows *a*) which in turn owing to the sector shape of the carbon segments is transformed into a circumferential pressure (arrow *b*). The mould 15 thus performs the same function as the clip 3 of Fig. 1, offering the advantage, however, that a very uniform pressure is exerted.

The carbon segments may be produced in known manner by grinding, individual pressing, bar extrusion pressing or the like in the sector shape and size required for the production of the collector body, and then assembled and cemented together as above mentioned. It is also contemplated, however, that the segments may be produced by pressing a complete cylindrical or truncated cone-shaped tubular carbon body, as shown in Figs. 5 and 6, respectively, and cutting the integral body into segments 16 or 16', by means of a mill cutter 17 or the like, the cuts 18 having a width corresponding to the thickness of the insulating layers. The dimensions of the circumference of the integral carbon body, the width of the cuts and the quantity of insulating material may be chosen to obtain a predetermined circumference of the collector and a predetermined thickness of the insulating layers. This manufacturing process substantially reduces

the operations so far required for the manufacture of carbon collectors.

Another simplification of the manufacturinng process is possible by producing the carbon segments or the compressed carbon bodies therefor in a length being a multiple of the final length of the collector and cutting the long body thus obtained into collectors of the desired length. This procedure is illustrated in Figs. 7 and 8, the dotted lines in Fig. 7 indicating the points where the long collector body is to be cut into pieces L_K of uniform length, while in Fig. 8 the dotted lines indicate that the long collector body, which in this case has been made in the form of a tubular truncated cone is cut into pieces of different lengths L_{Kx}, L_{Ky}, which then may be turned or ground on a lathe into cylindrical bodies of different diameters.

In some instances, it may even be possible to use the collectors in the conical form obtained by adoption of the method shown in Figs. 3, 4, 6 and 8.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

By way of example, Fig. 9 indicates a self-supporting collector ring **6** of our novel type mounted on a shaft **7**. The collector ring is insulated from the shaft by an insulating sleeve **8** and insulating end disks **9** and **10**. In order to fixedly secure the collector on the shaft and to transmit the torque on the same, it is forced by a nut **11** and counter-nut **12** on a threaded portion of the shaft against a shoulder **13** on the opposite side of the shaft, washers **14** being interposed to avoid undesirable stress in the carbon collector.

EBERHARD HOLLEBER.
HANS ZÖLLNER.

PUBLISHED MAY 18, 1943. BY A. P. C.

E. HOLLEBER ET AL
CARBON COLLECTOR
Filed Jan. 15, 1941

Serial No. 374,600
2 Sheets-Sheet 1

Fig. 1

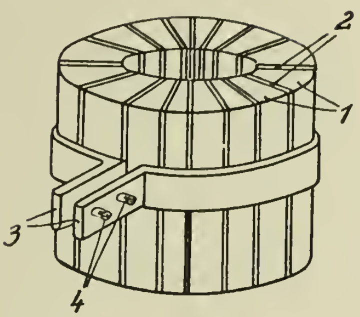


Fig. 2

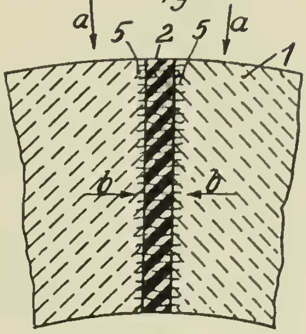


Fig. 3

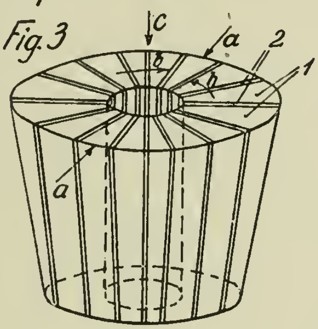


Fig. 5

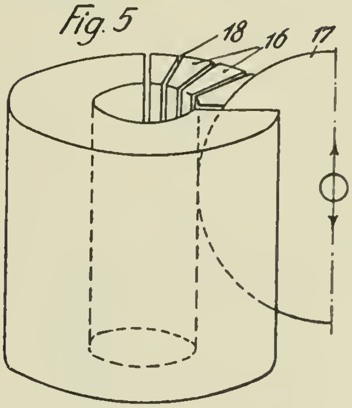


Fig. 4

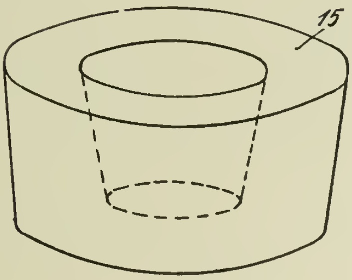
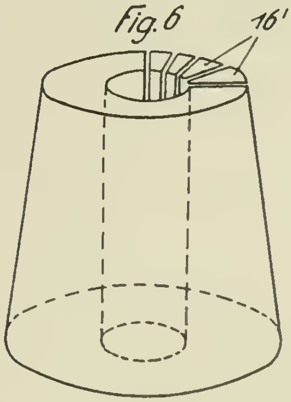


Fig. 6



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CARBON COLLECTOR
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2 Sheets-Sheet 2

Fig. 7

Fig. 8

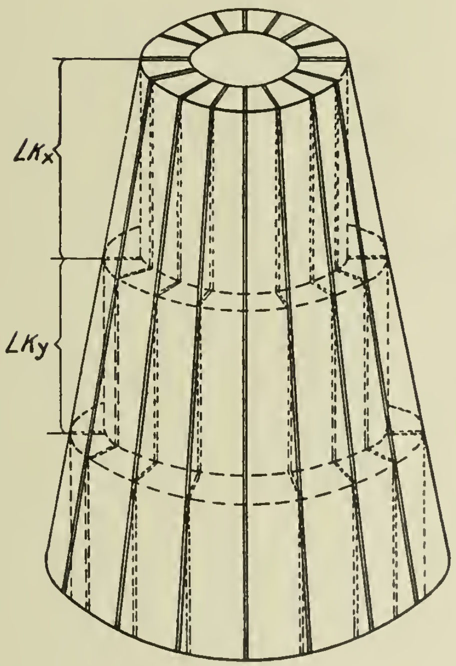
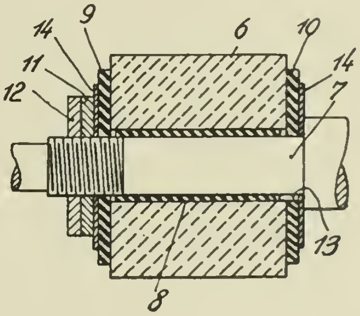


Fig. 9



Inventors:
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Published May 18, 1943

Serial No. 374,627

ALIEN PROPERTY CUSTODIAN

COIL WINDINGS

Pascal Carpentier, Paris, France; vested in the Alien Property Custodian

Application filed January 16, 1941

The present invention has for object improvements in coil windings applicable in particular, to various electric apparatus controlled by direct current contacts.

The difficulties encountered for maintaining the contacts subjected to the sparks, which are produced at the closing or breaking of the current, in good working condition, are already known.

These sparks result either in oxidations, or in rapid wear or deteriorations, or deposits of metal from one contact on the other. After a certain time of use, they cause bad contacts, or stickings, or weldings of the two contacts in presence.

These defects appear so much the more rapidly as the force which applies the contacts one on the other or which separates them, is slight. In particular, when contacts controlled by measuring apparatus are under consideration, bad contacts, or stickings occur after a relatively small number of operations, especially when very sensitive measuring apparatus is under consideration, that is to say having a very slight torque.

Various means have been proposed under the name of spark shields or spark filters, for reducing the effect of the sparks by acting either on the contacts, or on the windings placed in series with the latter.

The main cause of the production of sparks arises from the self-induction and from the capacity of the electric circuit controlled by the contact, and more particularly from the self-induction when relays or motors comprising a magnetic circuit are under consideration.

The device according to the invention, which is intended to considerably reduce the self-induction, consists in constituting by a special winding all the coils controlled by the contact to be protected.

The accompanying drawing shows, by way of example, a method of carrying out the coil winding according to the invention.

Each coil comprises two windings *a* and *b*, wound together in a single operation in such a manner that the wire constituting the first winding *a* is always placed side by side with the wire forming the second winding *b*. Said coil is adapted to allow of obtaining two identical windings having the same self-induction, and the electromagnetic coupling of which is as great as possible.

In practice, the value of the mutual induction is equal to the self-induction of each of the two windings.

The first of the latter, *a*, is placed in series with the contact to be protected, and the second, *b*, is short-circuited on itself. The apparent self-induction of the coil in series with the contact is null, and, consequently, this circuit having a purely ohmic impedance, the spark is practically eliminated.

The device according to the invention can be applied for instance to the windings of secondary relays, to the inductors of motors, dynamos or alternators; it then moreover offers the advantage that the circuit controlled by the contact having a purely ohmic impedance, the current supplying the controlled coil, instantaneously follows the variations caused by the contact, without the lag caused at the closing or at the opening, by the self-induction of the coils.

This advantage is particularly interesting when the controlled coil is an inductor of an electric generator, dynamo or alternator.

The voltage produced by the generator follows without lag the variations caused by the contact placed on the circuit of the inductors.

PASCAL CARPENTIER.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

P. CARPENTIER
COIL WINDINGS
Filed Jan. 16, 1941

Serial No.
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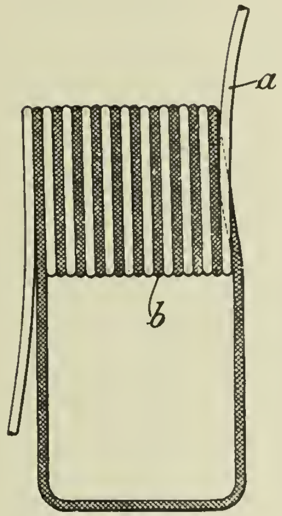

INVENTOR:
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BY Haseltine, Lake & Co.
ATTORNEYS

Published May 18, 1943

Serial No. 374,672

ALIEN PROPERTY CUSTODIAN

DRIVING ARRANGEMENT, ESPECIALLY FOR AIR PROPELLERS ROTATING IN OPPOSITE DIRECTIONS

Albert Friedrich, Stuttgart-Bad Cannstatt, Germany; vested in the Alien Property Custodian

Application filed January 16, 1941

The present invention relates to driving arrangements and more particularly refers to a drive for air propellers rotating in opposite directions. Hitherto two propeller shafts arranged one in the other have been driven by a gear mounted at the motor and rotating in a right hand and a left hand direction respectively. At the ends of these shafts the propellers were fixed.

Now, the present invention consists in arranging the air propellers upon a non-rotatable tube, preferably fixed to the motor—or the gear casing, and driving them by a shaft mounted in the interior of this tube.

The arrangement according to the invention has the advantage that for the drive of air propellers rotating in opposite direction a normal, not subdivided gear may be maintained at the motor, and that the weight of the propellers as well as centrifugal moments and torsional vibrations of the rotating members are absorbed by the stationary bearing tube only. The latter transmits all stresses occurring not upon the driving gear but directly upon the large mass of the motor—or gear block which easily absorbs or at least strongly damps all stresses. Moreover, the reversal gear may be arranged between the propellers due to the stationary bearing point resulting from the tube. This again allows an arrangement of the propellers very close to the gear block of the motor and this results in a shortening of the length of the construction as well as in a further reduction of the weight and a substantial care of the driving gear.

In the accompanying drawing some constructions according to the invention are shown by way of example.

In this drawing:

Fig. 1 shows a longitudinal section through the bedding and the drive of two air propellers in which the propellers are driven from the front end;

Fig. 2 is a cross section on line II—II of Fig. 1;

Fig. 3 is a longitudinal section through a bedding and a drive of two propellers rotating in opposite directions and driven by a spur gear arranged between them;

Fig. 4 is a cross section on the line IV—IV of Fig. 3; and

Fig. 5 shows a longitudinal section through the bedding and a drive of two variable pitch propellers rotating in opposite directions.

By way of a normal speed reducing gear 2 the motor 1 drives a preferably elastically rotatable hollow shaft 3. The latter is mounted with play in a tube 4 which is directly fixed to the motor or gear casing 5. Journalled upon the tube 4 are two air propellers 6 and 7 between which a bevel wheel gearing 8 is arranged cooperating with planet gears 9 and 10 respectively. The rim 9 is fixed upon the hub of the propeller 6 and the rim 10 upon the hub of the propeller 7. The sun and planet wheel gear is surrounded by an enclosure 11 the lateral edges of which freely may for instance at 12 bear on the hubs of the two air propellers, whereby the friction forces, acting in opposite directions upon the enclosure, are in equilibrium, and the enclosure remains stationary during rotation of th e air propellers. The enclosure 11 may also be connected to a stationary member of the aircraft. The hollow driving shaft 3 extends somewhat beyond the free end of the bearing tube 4 and mounted upon this end of the driving shaft is a member absorbing torsional vibrations, for instance a disc friction clutch 13 the driven portion of which is rigidly connected to the hub of the air propeller 6 most closely arranged to same.

The driving arrangement described above acts in such a manner that, by way of the disc friction clutch 13, the hollow shaft 3 drives the air propeller 6, and the rim 9 of the gear wheel appertaining to this propeller drives the bevel wheels 8. The latter in turn drive with the same number of revolutions by way of the rim 10 of the bevel wheel the shaft of the air propeller 7 in a sense of rotation opposite to that of the shaft of the air propeller 6. Torsional vibrations occurring hereby are absorbed by the elastically rotatable shaft 3 and the clutch 13, while gyroscopic momentums are absorbed by the tube 4. The clutch 13 preferably is adjustable. Instead of a disc friction clutch any other suitable clutch, for instance a liquid clutch, may be used.

In the modification shown in Figs. 3 and 4, the two air propellers 6 and 7 are driven by a spur gearing. For this purpose the bearing tube of the air propeller is subdivided into two members *4a* and *4b* of substantial equal length. As has been described in connection with the modification shown in Figs. 1 and 2, the tube member *4a* is fixed to the casing 5 of the motor gear. By a drum-like enlargement *4c* the other tube member *4b* is held in such a way that it shows a common axis with the tube member *4a*. The enlargement *4c* is shifted upon the free end of the tube member *4a* and fixed to same. The driving shaft 3 extends into the bearing tube *4c*, *4b* as far as to the enlarged *4c* only and its free

end carries a spur gear 14 which rotates in the enlargement 4*c*. The spur gear 14 engages a gear wheel 15 which on the one hand cooperates with the outer toothing 16 of a hub neck at the air propeller 6 and on the other hand with the inner toothing 17 of a hub neck at the air propeller 7. The gear wheel 15 is rotatably mounted upon a bolt 18 fixed at a side wall of the drum-like enlargement 4*c* of the bearing tube. Preferably three such bolts or gear wheels are uniformly distributed about the circumference of the spur gear 14 mounted on the end of the driving shaft 3, and the drum-like tube member 4*c* is provided at these points with corresponding recesses 19 to allow the gear wheels 15 to cooperate with the spur gear 14. The enlargement 4*c* is not required, if the outer diameter of the spur gear 14 is smaller than the inner diameter of the bearing tube 4*a*, 4*b*.

The operation of the arrangement shown in Figs. 3 and 4 easily results from the drawing. The elastically rotatable shaft 3 drives the spur gear 14 and the gear wheels 15 driven by the spur gear 14 drive the two air propellers 6 and 7 by way of the toothings 16 and 17 in opposite directions but with the same number of revolutions. With this modification also a clutch elastic in the direction of rotation may additionally be provided at the shaft 3, for instance within the spur gear 14.

The invention also is very well adapted for the drive of a variable pitch air propeller, as shown in Fig. 5. For this purpose toothed wheel rims 18 and 19 are rotatably mounted upon the guide rings 12 of the hubs of the air propellers. The toothed wheel rims 18 and 19 on the one hand cooperate with the variable pitch wheels 20 and 21, provided at the hubs of the air propellers and serving adjustment purposes, and on the other hand with a joint intermediate wheel 22. The shafts of the wheels 22 arranged vertically to the shaft of the air propeller are rotatably mounted in a casing part 11*a*. The wheels 21 adjusting the air propeller 7 are mounted upon rotating shafts, extending through the appertaining hub, and mounted upon the other ends of these shafts are adjusting wheels 23 which for instance cooperate with the inner toothing 23 of a gear wheel 25 mounted at 24 at the gear casing 5. The gear wheel 25, moreover, is provided with a second toothing 26 into which engages the driving pinion 27 of a variable pitch gear 28. In a manner known per se the latter may arbitrarily or automatically be controlled for instance in dependence on the number of revolutions of the drive shaft or shafts of the air propeller or air propellers respectively.

The operation of the arrangement just described is as follows:

By the opposite directions of rotation of the toothed rims 18 and 19 connected to the air propellers 6 and 7 respectively the intermediate wheels 22 are rotated, maintain, however, their position in the space. Hereby a fixed point is provided by means of which the adjusting forces may be supported which come to action if the position of the propeller blades is varied. The impulse given by wheel 27 of the variable pitch gear is transmitted by way of the toothed rim 25 upon the adjusting wheels 23, 21, the toothed wheel rim 18, the intermediate wheels 22, the toothed rim 19 and finally upon the variable pitch wheels 20. In a manner known per se and not shown in the drawing the axes of the variable pitch wheels are provided with worms which engage in a worm wheel fixed to the rotatably mounted blades of the air propeller. The air propeller may be provided with any desired number of blades. Moreover, more than two air propellers may be arranged one behind the other. A feeding device for the lubricating oil of the gear may be coupled to the intermediate gear, whereby for instance the stationary casing 11*a* simultaneously may be formed as lubricating oil tank and be provided with corresponding channels leading the lubricating oil to the points to be lubricated. The gearing for the variable pitch gear or the control rod system of the latter respectively may also be located in the hollow driving shaft 3 and act upon the variable pitch gear provided at the air propellers from the front or from the space between the air propellers. The selected arrangement, however, has the advantage that the hollow space of the driving shaft 3 is available for other purposes. Of course, a solid driving shaft also may be used. Eventually the air propellers may be driven with different numbers of revolutions.

The invention quite generally is an improvement of drives in which a primary shaft elastically in the direction of rotation drives, eventually by way of an intermediate member damping torsional vibrations, a secondary shaft in so far as with the subject matter of the invention particularly the secondary shaft is released as far as possible from gyroscopic momentums and bending stresses by the bearing tube arranged between the primary and secondary shaft so that practically torsional moments only are absorbed by the two shafts and no transverse forces occur at the damping member arranged between the two shafts.

The driving arrangement according to the invention also may be used for driving a sole air-screw or two air-screws combined and rotating in the same direction or each other screw driving mechanism, e. g. a ship propeller.

ALBERT FRIEDRICH.

PUBLISHED

MAY 18, 1943

BY A. P. C.

A. FRIEDRICH

DRIVING ARRANGEMENT, ESPECIALLY FOR AIR PROPELLERS ROTATING IN OPPOSITE DIRECTIONS

Filed Jan. 16, 1941

Serial No. 374,672

Fig.1.

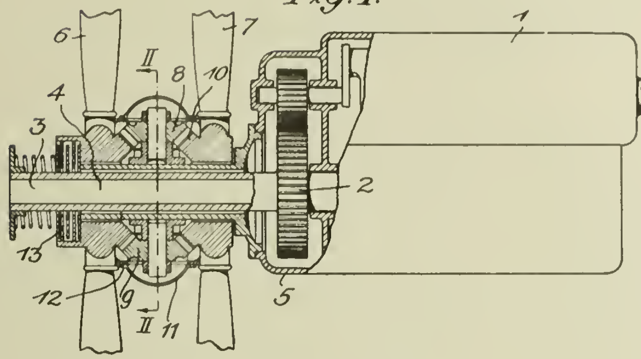


Fig.2.

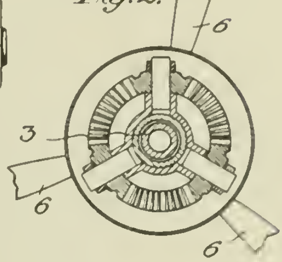


Fig.3.

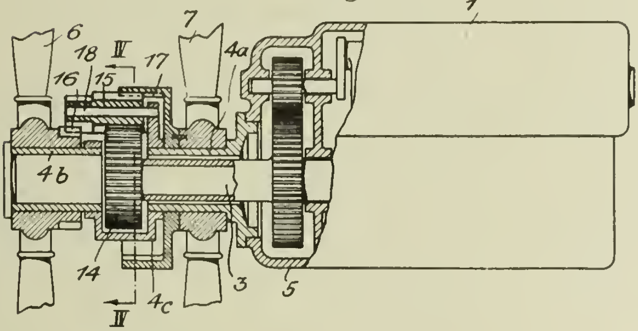


Fig.4.

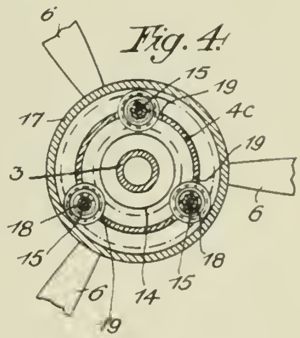
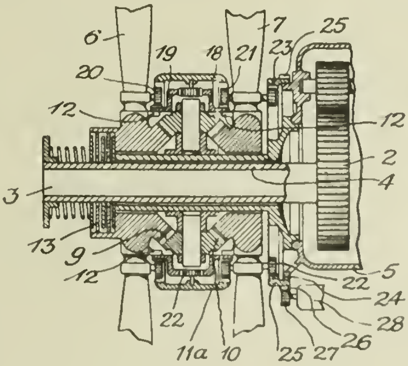


Fig.5.



INVENTOR

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Haseltine, Lake & Co

ATTORNEYS

Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

ELECTRICAL DRIVE FOR WHEEL TYPE PRESSES OR THE LIKE

August Walther, Francfort-on-Main-Oberrad, Germany; vested in the Alien Property Custodian

Application filed January 16, 1941

This invention relates to the drive of presses or the like which, particularly as in the case of wheel type presses for the cementing of boots and shoes, work by steps and whereby wheels of a relative great diameter are rotating.

In the case of wheel type cementing presses for boots and shoes, the wheel has been rotated either by hand or by power drive with special worm gears effecting the rotation of the wheel through the main axle, or chain drives have been used for this kind of drive.

This invention, now, comprises an efficient drive provided at the circumferential surface of the wheel having a toothed rim. The power drive situated directly at the wheel rim is preferably of the electrical type, therefore, requiring only a minimum of space, the electrical device allowing a simple wheel rotation by steps so that the hitherto arranged complicated cam clutches or the like operated by means of a foot lever, are avoided. Such clutches require with respect to the frequency of the reversing- and braking operations, expensive devices and a substantial strain of the operator, whereas the electrical drive works completely automatically.

An example of the new drive for a wheel type press according to the invention is illustrated in the drawings.

Fig. 1 shows a wheel type press with the new drive but only with a part of the wheel, however without the pressing tools and their controls.

Fig. 2 shows the electrical arrangement of the drive.

On the pillar 1 of a wheel type cementing press, a wheel 3 is placed on axle 2, a toothed rim 27 being arranged at the circumference of the wheel and moved by means of a pin gear drive. On the side of the pillar 1 an electro-motor 30 is fixed, and the gearing 26 with the housing 31 is mounted on the flanges 4.

The pin gear drive consists of a small electromotor 30, the gearing 26, 28, 29, the electrical brake 39 and the switch board 33. The motor 30 drives with the driving belt or chain 5 the wheel 6, the worm 29, the worm wheel 28, and the pin wheel 26 gearing with the toothed rim 27. Thus, the most efficient working point at the largest lever-arm is given making possible to use an extremely small motor power. The combined pin wheel gear is fixed on the pillar 1 only by means of two screw bolts 32 and may, therefore, be easily detached and packed in composite state, being protected by casing 31 against outer disturbing influences.

In Fig. 2 the electrical arrangement is represented effecting the connections by means of the switch board 33, to the foot lever 38, motor 30, contact switch 36, and the brake magnet 35.

The foot lever 38 causes through contact 37 the connection to the switch board 33 supplied with current by the main conductors or feeders 34. The electrical brake comprises a brake magnet 35 with a compression spring 40 and the brake shoe 39. In case the brake magnet is dead, the spring 40 presses the brake shoe 39 onto the brake wheel 6 fitted on the worm shaft 29.

The contact switch 36 has a spring actuated switch pin 42 disposed in the conductor line 7 and controlled by means of a cam 41 on the worm wheel 38.

Starting the machine or the wheel 1 respectively, the operator presses the foot lever 38 down and closes thereby the contact 37 whereby at first the brake magnet 35 being excited over the switch board 33 and, then, the brake 39 is released against the pressure of spring 40. At the same time, the motor 30 is started, thus turning the wheel 1 by means of the transmission. The wheel having now proceeded about one field with the press points arranged on it, the cam 41 runs upon the pin 42 and displaces it against the spring action so that the current is interrupted. The brake 39 is then applied at once by the action of spring 40; i. e. the motor 30 and the wheel 1 are thus quickly brought to the rest. The new press member is served, and a new play of the wheel movement may begin with the pressing down of the foot lever 38.

In case a certain number of press members being omitted, the foot lever 38 should be left pressed down until the desired press member arrives, as the wheel continues revolving without stopping.

AUGUST WALTHER.

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BY A. P. C.

A. WALTHER
ELECTRICAL DRIVE FOR WHEEL TYPE
PRESSES OR THE LIKE
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FIG. 1.

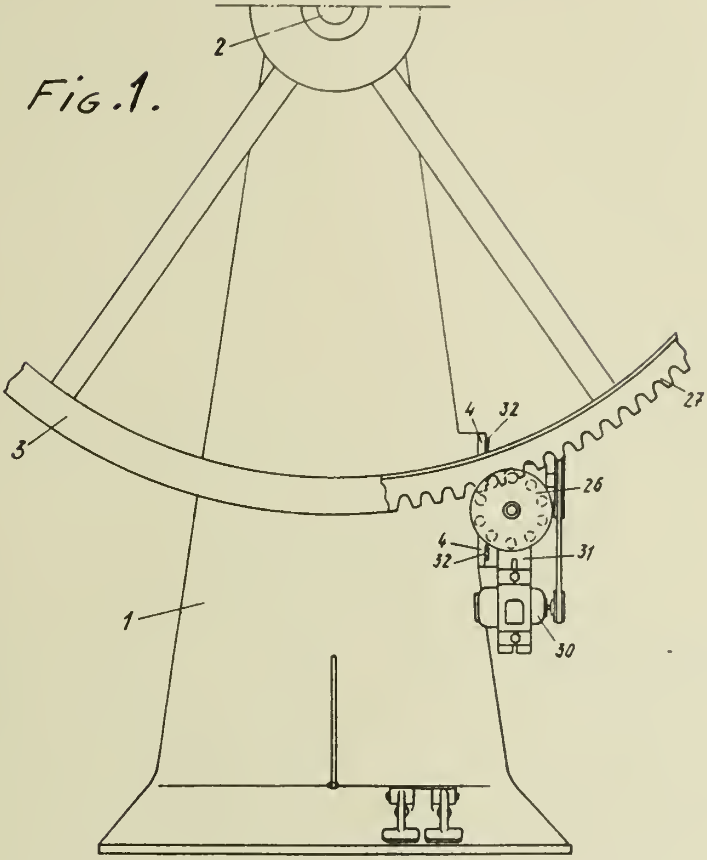
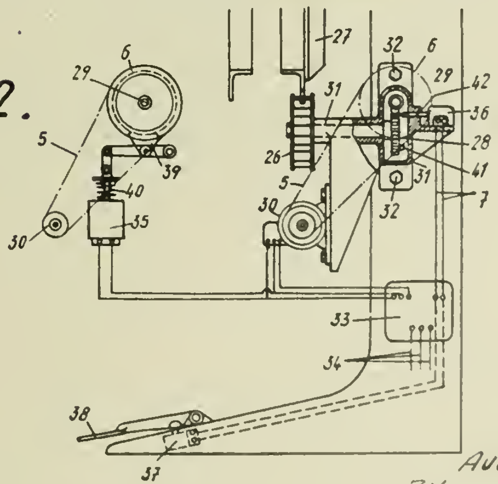


FIG. 2.



INVENTOR
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BY
Richards & Geier
ATTORNEYS

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ALIEN PROPERTY CUSTODIAN

ELECTRIC CONDENSER

Walter Voigtmann, Berlin, Germany; vested in the Alien Property Custodian

Application filed January 17, 1941

This invention relates to a new and useful method of making condensers with an electrostatic layer forming a stratified condenser comprising a thin glass foil acting as the dielectric and having a thickness of 100 microns or less.

Electric condensers of the stratified or layered type are known in the art which have a dielectric consisting of relatively heavy layers of glass. These condensers inhere the drawback that the dielectric coats or layers aften crack when subjected to the requisite compression so that the condenser becomes useless.

According to the invention this difficulty is avoided by using a layer of glass or foil of glass having a thickness preferably of less than 100 microns, such glass film being used in lieu of mica which is customarily employed in layered condensers. Such a thin layer of glass will withstand even the highest compressions, inasmuch as it is practically free from brittleness so much so that it will adapt itself to such irregularities as may exist.

The drawing illustrates an exemplified embodiment of the basic idea of the invention. What is here shown is a stratified condenser in which the coats are connected in parallel. All coats of one polarity are denoted by **1**, while those of opposite polarity are designated by **2**. The dielectric material which consists of a tenuous foil of glass is shown by the dash lines and denoted by **3**.

Another embodiment would be to form each dielectric by using a plurality of layers cemented together to further reduce the danger of the glass dielectric from cracking.

WALTER VOIGTMANN.

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W. VOIGTMANN
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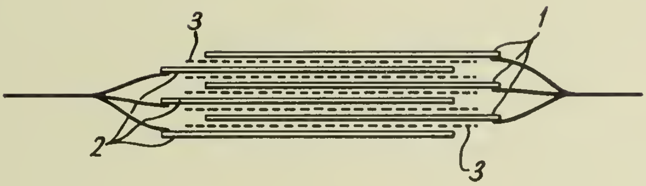

INVENTOR
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BY H. S. Grover
ATTORNEY

Published May 18, 1943

Serial No. 374,907

ALIEN PROPERTY CUSTODIAN

DEVICES FOR PRODUCING STORING TAPES FOR TELEGRAPH TRANSMITTERS

Herbert Wüsteney, Berlin-Wilmersdorf, Germany; vested in the Alien Property Custodian

Application filed January 17, 1941

This invention relates to improvements in devices for producing storing tapes for telegraph transmitters.

In telegraphy, storing tapes are, as a rule, employed which are prepared on a particular device. In general, perforated tapes have hitherto been employed for this purpose which are perforated on the so-called keyboard perforator and transmitted to a perforated tape transmitter.

The known devices for the production of storing tapes, particularly the so-called keyboard perforators are relatively complicated. They necessitate a motor drive, a set of selector bars and devices for the keyboard as is usual in standard teleprinters for the five-unit code.

The object of the invention consists in simplifying the construction of such devices. To this end, the type levers of a normal typewriter carry as types the combination images of a teleprinter code so that upon the depression of the key, the typewriter records the combination images on a tape or sheet.

The device is rendered particularly simple if the impulse images are impressed on the storing tapes in the same manner as the letter images in any standard typewriter. In this case the typewriter may be employed instead of the keyboard perforator without it being necessary to employ the motor drive.

If impulse combinations of the six-unit code are employed according to the invention for the impulse images also all devices for the type case shifting; i. e., the shift bars and the locking bars may be dispensed with on the keyboard perforator. To maintain the tapes and types narrow the impulse images are arranged side by side in various, preferably in two rows.

The construction of the typewriter need insofar be altered as it is provided instead of with the roller and carriage with guiding and stepping mechanisms for a paper tape.

The control motion for the actuation of the stepping mechanism may be derived in a simple manner from the devices of the typewriter which control in the case of a standard construction the step by step advancement of the carriage. To produce the impulse images on the tape in an accurately defined position, it is preferable to employ a tape which is preperforated and which is advanced by a correspondingly toothed roller.

A tape as just described is preferably prepared in a transmitter which scans the impulse combinations of the six-unit code in a manner well known in the art, but transmits the impulse combinations of the five-unit code and inserts upon the shifting of the type case the corresponding shift combination automatically. For the photoelectrical utilization the transmitter must be correspondingly constructed; however, also such photo electrical scanning devices are well known.

In the accompanying drawings is shown in Figs. 1 and 2 the device according to the invention in diagrammatic form. The complete typewriter is not shown but only the parts which are essential to the invention.

In a type segment 1 are mounted as indicated at 3 the type levers 2. Only one type lever 2 is shown. The type lever is pulled as indicated at 4 in the direction of the arrow by the key lever and the intermediate articulated joint, thus bringing it into the position shown. To the segment 1 is secured a bearing block 5 on which is mounted a lever 7 as indicated at 6. On the same block is arranged a control lever 8 as indicated at 9. The two levers 7 and 8 are pivotally secured at their lower ends to a stepping ring 10 which under the action of the type lever stop is displaced in parallel relation to itself. The type lever contacts the stepping ring 10 as indicated at 11 shortly before it attains the stop position shown and presses it upon depression of the key lever into the position shown. The control lever 8 is rotated in counter-clockwise direction by the spring 12 secured to the segment 1 as soon as the type lever returns to its initial position. The stepping ring 10 is designed in the form of an arc as shown in Fig. 1 and is therefore actuated by all type levers.

Instead of a roller the typewriter is provided with a stop plate 13 over which passes a paper tape 24. The paper tape is supplied through rollers from a pay-out receptacle in a manner as is usual in teleprinters and is advanced by a feed reel 14. This reel is pressed under the action of a spring 15 by a lever 16 against a counter-roller (not shown) so that upon its rotation the tape is advanced by a step. The feed reel 14 is arranged on the same axis 19 with a gear 20 with which two fork-shaped ends 21 and 22 of the control lever 8 come into engagement. In this manner upon each reciprocation of the lever 8, i. e., upon each stop of the type, the feed reel is advanced by a step. To maintain an accurate division a ratchel wheel may be provided in a known manner for the feed shaft.

When using a typewriter with motor drive, the feed shaft is preferably driven by the motor and released by the lever 8 only step by step.

The feed reel 14 is provided with feed pins 17 and the paper tape is preperforated as indi-

cated at 18 so as to attain an exact division. In this manner the type print appears always at a point which is accurately fixed with respect to the perforation so that the scanning which is effected in a transmitter with the aid of a photoelectrical scanning may be considerably simplified. However, the preperforation of the strip may also be dispensed with. In this case the transmitter must be provided with a device which permits upon the commencement of the scanning to adjust the proper position of phase of the tape with respect to the scanning point and to maintain it during the passage of the tape.

The types 23 of the type lever are so designed that combination images as shown in Fig. 3 are produced on the tape. Consequently, the tape lever carries the combination images of the six-unit code instead of letters and figures. The combination images of the six-unit code are denoted in Fig. 3 in succession by 0, I, II, III, IV and V. At first the number "6" is represented which belongs to the figure case. It is assumed that the characteristic impulse, i. e., the impulse which determines the type case is a current impulse for the figures.

The corresponding point of the storing tape is therefore not printed. In the same column as the characteristic impulse are represented the two first impulse combinations of the figure "6," i. e., "no current" — "current." The impulse combinations III to V are printed in the next column. They consist of "not current" — "current" — "no current." Let "R" be the next impulse combination. By depressing the type lever the impulse combination —+—+—+ (+ corresponds to "current," — to "no current") is printed. To enable the printing of figures which are produced in a typewriter by depressing the shift key and another key two impulse combination images may be arranged one over the other on separate type levers and the selection of the various impulse combinations is then effected by raising and lowering the stop plate 13 and the tape 14.

The use of the six-unit code removes all these difficulties which would otherwise be presented as a result of the type case shift to be inserted when using a standard typewriter for printing impulse combinations according to the five-unit code.

The tape printed according to the six-unit code may, however, be scanned in a known manner by a transmitter which transmits impulse combinations of the five-unit code and which inserts the shift combinations automatically when shifting the type case.

To avoid faults from occurring as a result of faults in the paper or of dust falling into the telegraph transmitter and the like, the impulse combinations may be printed as shown in Fig. 4 side by side in the reverse sense. The same figures are chosen as in Fig. 3. In the first column are printed the first three impulses of the impulse combination for the figure "6." Then follows the repetition of this line in the reverse sense which is naturally printed by the same type levers. Instead of a space not printed there appears upon this repetition always a printed space and instead of a printed space a space not printed. The telegraph transmitter which scans these impulse images photoelectrically must be so designed that the impulse is transmitted only if the impulse images correspond to the original impulse combination and to the repetition.

HERBERT WÜSTENEY.

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H. WÜSTENEY
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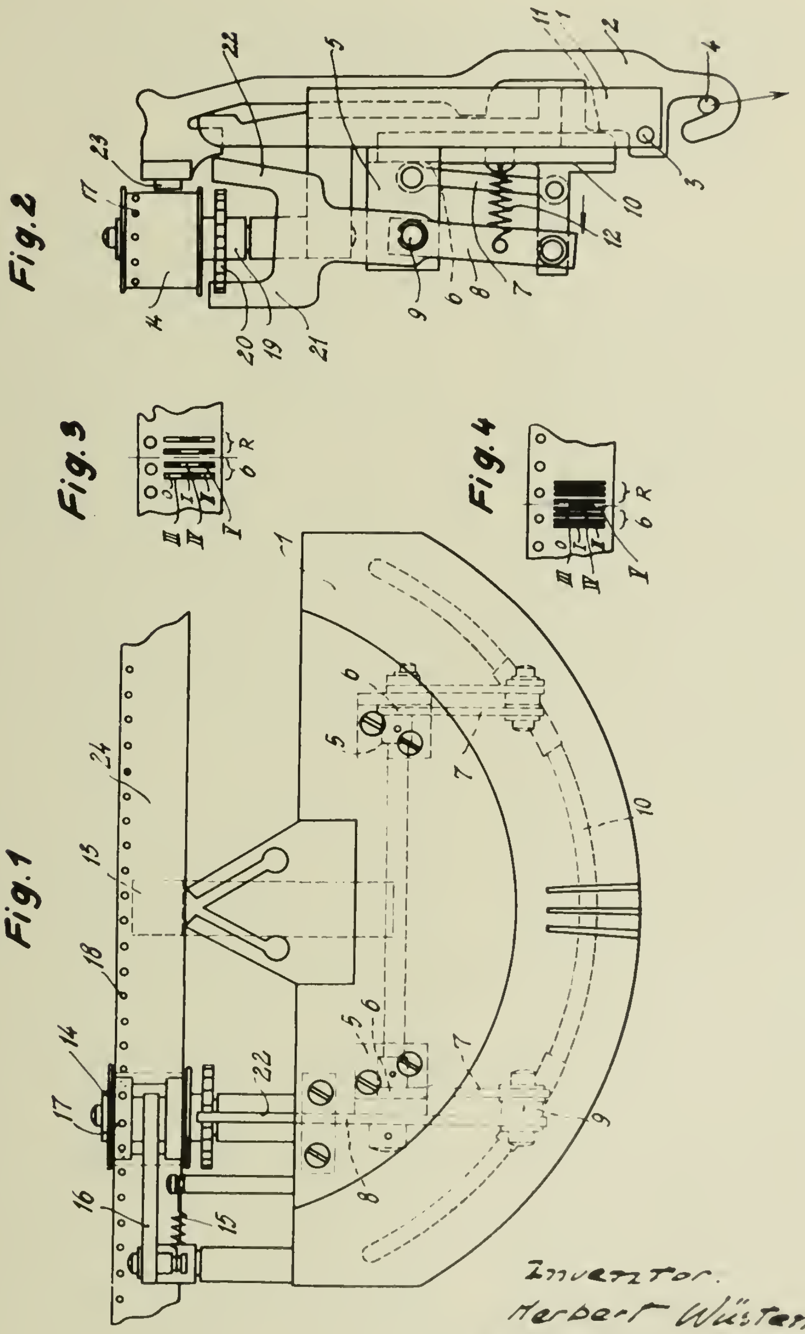

Inventor.
Herbert Wüsteney
By Richardson & Geier
Atty's.

Published May 18, 1943 Serial No. 374,956

ALIEN PROPERTY CUSTODIAN

MODULATOR AND DEMODULATOR SYSTEMS

Frans Louis Henri Marie Stumpers and Willem Christiaan Van Geel, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed January 18, 1941

This invention relates to arrangements respectively for modulating and demodulating electric oscillators, comprising a bridge circuit or a double balanced circuit of four rectifiers.

Such arrangements are used inter alia in carrier wave telephony systems, in this case the condition being imposed that in the output circuit the carrier wave must be suppressed as completely as possible.

It is customary for the rectifiers to use dry-metal or metal-oxide rectifiers. The electric substitution diagram for such a rectifier is mainly a capacity C shunted by a resistance R (see Fig. 1), the capacity and the resistance being a function of the voltage applied. The values of the capacity C and of the resistance R for various rectifiers of the same type are generally unequal for one and the same voltage, due to which a certain carrier-wave voltage, the so-called carrier-wave leakage, will occur notwithstanding in the output circuit.

In order to attain a lowest possible carrier-wave leakage, it is known to balance the circuit used; this means that the impedances of the various branches of the circuit are adjusted or chosen, for example, by means of adjustable resistances or condensers, in such manner that no carrier-wave leakage or substantially no carrier-wave leakage occur. Now the capacity C is a function of the carrier-wave voltage applied so that, if the capacity is C at a carrier-wave voltage having an effective value E, the capacity will be $C+\Delta C$ at a voltage $E+\Delta E$. This ΔC is in general also unequal for various rectifiers of the same type. This results in the circuit, if balanced for a certain value E_m of the carrier-wave voltage, being in general no longer balanced for a carrier-wave voltage differing from E_m, due to which the carrier-wave leakage becomes inadmissibly high.

By choosing rectifiers exhibiting an at least substantially equal E—C characteristic curve, it is possible to maintain the carrier-wave leakage low even with the practically occurring differences from the carrier-wave voltage E_m prescribed. This method, however, is cumbersome and gives many rejects.

According to the invention, in an arrangement for modulating and demodulating electric oscillations comprising a bridge circuit, a double push-pull circuit of four rectifiers exhibiting substantially balanced rectifier characteristics and rectifier capacities with a prescribed value of the carrier-wave voltage supplied to the circuit, the four rectifiers are grouped in such manner that the resulting capacity variation which is decisive for the carrier-wave leakage is a minimum with the occurring differences from the prescribed value of the carrier-wave voltage. In modulators and demodulators such as used in the carrier-wave telephony systems, an admissibly low carrier-wave leakage for carrier-wave frequencies up to 100 kilocycles is obtained if the resulting capacity variation is inferior to 50 micromicrofarads.

The invention will be more clearly understood by reference to the accompanying drawing in which Fig. 2 shows a double push-pull circuit of four rectifiers, 1, 2, 3 and 4 which are connected respectively to input terminals 5, 6 and to output terminals 10, 11 by means of double push-pull transformers 7 and 9. A carrier-wave generator 8 is connected in the indicated manner to the two push-pull circuits. The modulated oscillations are supplied to the input terminals 5, 6, while the side-bands without carrier wave can be taken from the output terminals 10 and 11. An adjustable potentiometer 12 is provided to make the resistances equal in each of the double branches, while the resulting capacity of the branches for a certain prescribed voltage of the carrier-wave generator 8 can be balanced out by means of an adjustable condenser 13.

In order to be able to find which grouping gives the least carrier-wave leakage with a certain voltage variation, the following argumentation can be made up. Assuming the circuit not yet to be balanced exclusively as regards the capacity of the rectifiers, a carrier-wave component is still present in the voltage derived from the terminals 10 and 11, which component originates from the resulting voltage of the four carrier-wave voltages induced by windings 14, 15, 16 and 17 in the winding 18 of the transformer 9.

In the case assumed the carrier-wave voltage induced by the winding 14 is a function of the capacity C_1 of rectifier 1 and is opposite to the carrier-wave voltage induced by the winding 15 which is a function of C_2. The carrier-wave voltages induced by the windings 16 and 17 are dependent respectively on C_3 and C_4 and are also opposite to each other.

Since the circuit, except the capacities, is balanced, the resulting voltage induced in the winding 18, i. e. the carrier-wave leakage L consequently is a function of $f(C_1+C_4-C_2-C_3)$. If a condenser 13 is provided, as is shown in Fig. 2, $L=f(C_1+C_4-C_2-C_3-C_{13})$. By adjustment of this condenser the circuit for a certain carrier-wave voltage E_n may also be balanced according

to the capacities, in which case one end must be connected to point **19** or **20**, according as the one or the other double branch exhibits too small a capacity, and $C_1+C_4-C_2-C_3-C_{13}$ can be made equal to 0, in which case no carrier-wave leakage occurs. If now the carrier-wave voltage E_n varies to a value $E_n\ \Delta E$, then carrier-wave leakage ΔL_1 will occur again which is given by:

$$\Delta L_1=f(C_1+\Delta C_1+C_4+\Delta C_4-C_2-\Delta C_2-C_3-\Delta C_3-C_{13} \\ =f(\Delta C_1+\Delta C_4-\Delta C_2-\Delta C_3)$$

Two other groupings of the four rectifiers are still possible, in which case the rectifiers **2** and **4**, and **2** and **3** respectively have changed their places, said groupings each involving another carrier-wave leakage which is then given respectively by:

$$\Delta L_2=f[\Delta C_1+\Delta C_2-(\Delta C_3+\Delta C_4)]$$

and

$$\Delta L_3=f[\Delta C_1+\Delta C_3-(\Delta C_2+\Delta C_4)]$$

In order to attain the lowest carrier-wave leakage with a variation in the carrier-wave voltage, according to the invention that grouping is chosen for which the ΔL has the smallest absolute value.

If the corresponding carrier-wave leakage still remains above the value considered admissible, the desired improvement can be attained by replacing at least one of the rectifiers by another rectifier so that the absolute value of the expression $\Delta C_1+\Delta C_4-(\Delta C_2+\Delta C_3)$ decreases so that the desired small value of ΔL is obtained. At the same time the condenser **13** is to be readjusted so that the circuit for the voltage E_n is brought again in push-pull. This is necessary because the replacing rectifier or rectifiers will have another ΔC and also another C. It has been found in practice that for carrier-wave telephony purposes the term $\Delta C_1+\Delta C_4-(\Delta C_2+\Delta C_3)$ must not exceed any more the value 50 micromicrofarads.

By measuring on a number of rectifiers the ΔC corresponding to the ΔE which is to be taken into account and by dividing these rectifiers in groups, each comprising only rectifiers of which the ΔC's are not farther away from one another than 50 $\mu\mu$F so that the limits of the capacity variations of each group are equally far away from one another, it is always possible by means of four rectifiers forming part of one group to compose a modulator or demodulator circuit so that

$$[\Delta C_1+\Delta C_4-(\Delta C_2+\Delta C_3)]$$

is <50 micromicrofarads.

In fact, the most disadvantageous position arises when the ΔC of one of the rectifiers is greater or smaller to the extent of 50 $\mu\mu$F than the ΔC of the three other rectifiers and in this case the resulting capacity variation of the whole circuit is also but 50 $\mu\mu$F.

It is evident that the invention does not exclusively apply to circuits according to Fig. 2 but to all modulation and demodulation circuits comprising a number of rectifiers in bridge or push-pull connection and that corresponding conditions can be derived therefor.

Thus, Fig. 3 represents a so-called ring modulator for which, considering the numbering of the rectifiers, the carrier-wave leakage is determined by the expression $\Delta C_1+\Delta C_4-(\Delta C_2+\Delta C_3)$ for a minimum carrier-wave leakage at a voltage $E_n+\Delta E$, E_n in this case being the value of the carrier voltage for which the push-pull is adjusted.

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Fig. 1

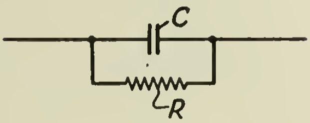


Fig. 2

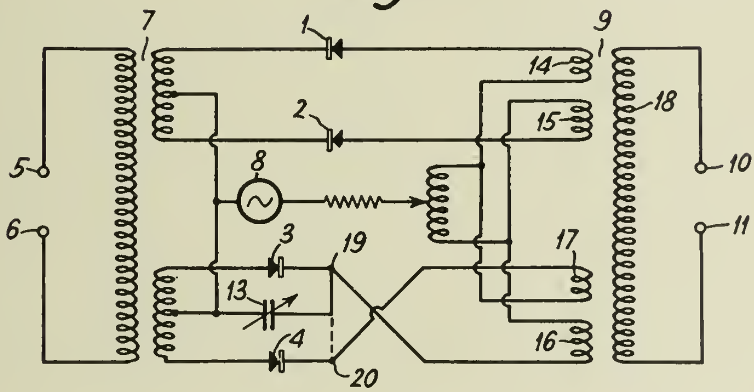
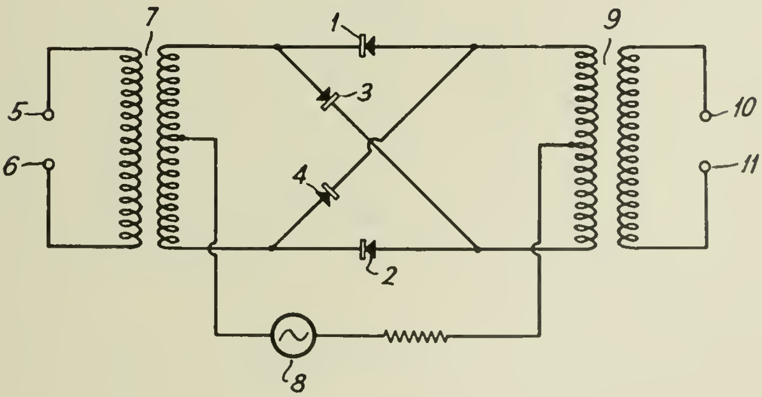


Fig. 3



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ALIEN PROPERTY CUSTODIAN

TELEPRINTERS

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Application filed January 25, 1941

This invention relates to improvements in teleprinters.

In the teleprinting art it is usual to combine a transmitter with a receiver to a unit so as to enable an up and down working. In certain cases this arrangement presents, however, disadvantages.

This is, for instance, the case in road-traffic signalling systems. In general, two lines and at train signalling stations. It is true that a simultaneous up and down working of these two lines may in general be dispensed with; however, each of the two lines must be ready for receiving signals.

According to the invention a particularly advantageous apparatus is employed for such operating conditions. The invention consists in combining a transmitter and various receivers to a unit in the manner that the transmitter and one of the receivers may alternately cooperate with a remote apparatus so as to effect an up and down working, while the other receivers receive the text to be transmitted from the other remote transmitters.

In such an apparatus all receivers, preferably two receivers being employed, are always connected to the corresponding line. Consequently, in urgent cases which occur particularly when the train travels at a high speed, the signal can always be received. As compared to the use of two complete telegraph apparatus the apparatus according to the invention is insofar simpler as only one transmitter with a keyboard and a driving motor is necessary. The number of the receivers may be adapted to the prevailing operating conditions. Known connections for the remote control may be employed for starting the apparatus.

If only one line is employed at a certain station the connection may be carried out in such a manner that the second receiver serves as a standby. In this case a corresponding double-throw switch is furthermore provided.

The apparatus with various receivers may, however, be used preferably at stations which are connected to one or more lines passing by the stations, for instance, intermediate stations connected to district lines, block stations connected to train signalling lines etc. It may also be employed if lines passing by and ending at the stations are to be connected.

The receivers, the transmitter and the motor are preferably arranged on a common base plate so as to attain a self-contained apparatus. The transmitter and receivers, each of which is provided with a separate driving coupling, are driven by the common motor through a gearing.

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form.

Fig. 1 shows a side elevational view of the apparatus and Fig. 2 the top view thereof.

Fig. 3 shows a connection of the apparatus with the change-over switch for use on two lines and Fig. 4 a connection with one line in which the second receiver serves as a standby receiver.

On the base plate **1** is secured a motor **2** which drives through a pinion **3** a gear **4** mounted on the shaft **5**. On the shaft **5** is also mounted a gear **6** which in turn drives the gears **7** and **8**. The gear **4** drives a further gear **9** secured to the shaft **10** on whose end is mounted the coupling **11**. On the transmitting shaft **12** is arranged the second disk of the friction coupling **11**. The coupling is released in a known manner through the bars **13** and **14** by depressing one of the keys **15** for one rotation.

The gear **7** drives the receiver shaft **17** of the one receiver through the coupling **16**. The coupling is stopped by the armature of the receiving magnet **18** in a known manner (not shown) until the arrival of the starting impulse and is then released for one rotation. The printing of the letters on the paper tape **19** is effected in the usual manner, for instance, by building up or forming the image of the letters of character elements, such as is described in the U. S. Patent No. 2,139,352. The receiver may, however, be also operated on any other known telegraphic principle; for instance, on the five-unit code or the facsimile principle. The typewheel is inked by the ink roller **21**, while the paper tape **19** is pressed against the typewheel **20** by the spring **22** of the printing hammer **23**. In exactly the same manner the gear **8** drives through the coupling **24** the shaft **25** of the second receiver which is controlled by the armature of the receiving magnet **26**. The parts of the second receiver correspond exactly to the parts of the first receiver so that a further description thereof is not deemed necessary.

In Fig. 3 the apparatus is shown as connected to two lines. When connecting the transmitter to the line L_1 the change-over switch UE is in the position shown and the circuit extends from the battery B through the transmitting contact *sk*, the contacts ue_3 and ue_4 respectively, the two windings I and II of the receiving magnet **18**, the two conductors *a* and *b* of the line L_1 to the remote apparatus. At the same time the

voltage of the battery B is applied to the conductors *a* and *b* of the line L_2 through the contacts ue_6 and ue_8 and the two windings I and II of the magnet **26**. In this position the transmission and reception may therefore be effected over the line L_1, i. e., impulses arriving over the line L_1 influence the receiving magnet **18**. At the same time also a reception may be effected over the line L_2 controlled by the receiving magnet but a transmission cannot be effected at the same time.

If the transmission is to be effected over the line L_2 the switch UE is changed over so that the transmitter is connected through the contacts ue_1 and ue_3 to the windings I and II of the magnet **26** and the battery is connected to the contacts ue_5 and ue_7 and therefore to the two windings I and II of the magnet **18**. In this connection the receiving magnet **18** is operated from the line L_1 and only a reception can be effected over this line. A transmission and a reception may be effected over the line L_2. To avoid disturbing interruptions of current or short circuits the contacts of the change-over switch must be so controlled as to obtain the following sequence of operations:

(1) UE5 and UE7 close
(2) UE6 and UE8 open
(3) UE2 and UE4 open
(4) UE1 and UE3 close

By changing over the switch to the position shown the following sequence of operation is to be maintained.

(1) UE6 and UE8 close
(2) UE5 and UE7 open
(3) UE1 and UE3 open
(4) UE2 and UE4 close.

In Fig. 4 is shown how the apparatus may be connected to one line. In this case the second receiver serves as a standby. Besides the change-over switch UE which is provided at all events, a second change-over switch UL is employed, to the control contacts of which are connected the conductors *a* and *b* of the line L. These central contacts may be connected either to the contacts **1** and **3** or **2** and **4** and therefore either to the coils of the magnet **26** or to those of the magnet **18**. The change-over of the transmitter is effected in the same manner as in Fig. 3 by means of the change-over switch UE.

If a key **15** of the apparatus shown in Figs. 1 and 2 is depressed in one of the two connections shown in Fig. 3 or 4, the coupling **11** is released for one rotation and the transmitter transmits the corresponding series of impulses. The receiver lying in the same line prints the text transmitted and at the same time the text transmitted from a separate remote apparatus may be received on the second receiver.

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2 Sheets-Sheet 1

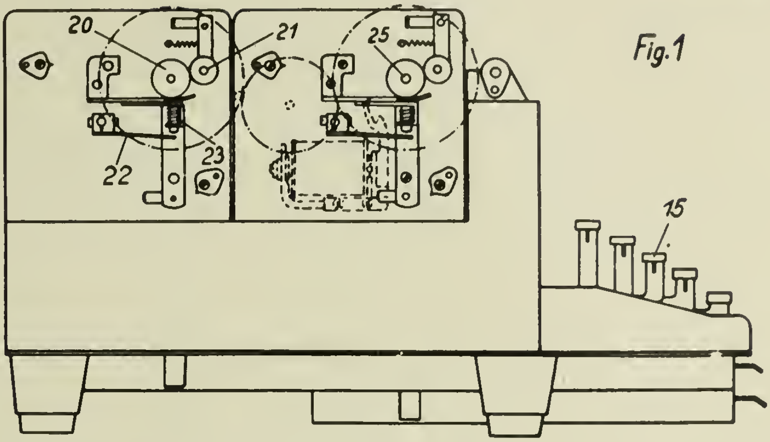

Fig. 1

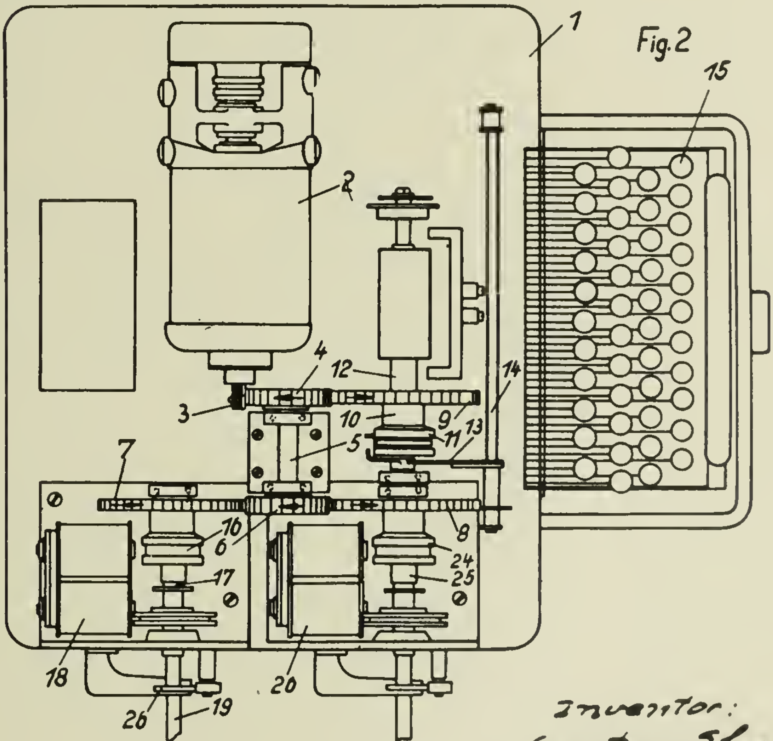

Fig. 2

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Fig. 3

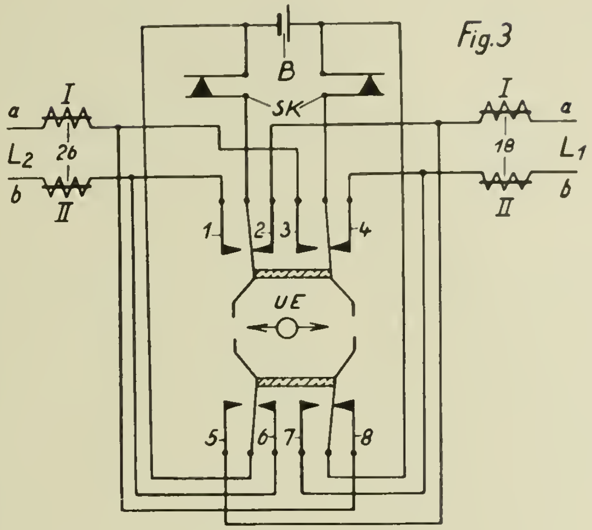
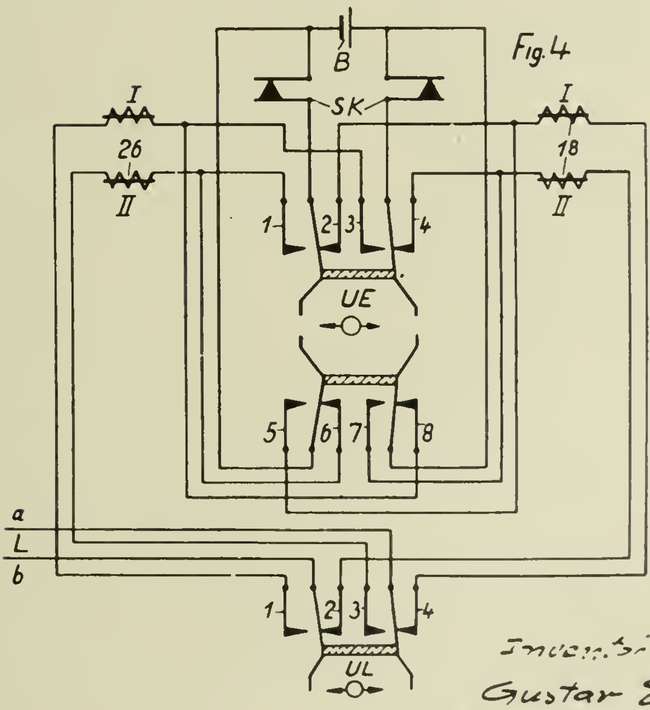


Fig. 4



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ALIEN PROPERTY CUSTODIAN

TYPEWRITING MACHINE WITH COVERING HOOD ADAPTED TO BE FOLDED UP

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Application filed January 28, 1941

It has already become known in typewriting machines to cover by a hood the driving mechanism and the ink ribbon spools. The hood is oscillatably mounted on the machine frame so that it can be folded up in order to render accessible the elements of the typewriting machine which are covered by the hood. The covering hood can be folded up in the direction of the platen. The inconvenience consists, however, that at the folding up of the covering hood it strikes, when the carriage is in certain positions, against projecting elements of the carriage, for instance against the return lever, whereby these elements and also the hood are damaged. It has therefore been proposed, to prevent folding up of the covering hood by a locking device as long as projecting parts of the carriage are above the hood.

This known arrangement possesses, however, the inconvenience that several manipulations are required for its attendance. If the locking device is in the locking position and if the locking bolt holding the covering hood in the locked position is unlocked by the actuation of a push-knob, the hood remains closed and, for instance after the carriage has been pulled out towards the left, the locking bolt has to be pulled back again. This is comparatively complicated and does not allow quick typing.

Further the known arrangements have the inconvenience that the hoods can be opened only by a limited angle which is almost always below 90°. The accessibility to the elements under the hood is thereby rendered more difficult. The small opening formed by the folding up of the hood according to the known arrangements is almost too narrow for hanging the ink ribbon into the ink ribbon fork or for removing the same. In such coverings it is therefore necessary, to provide in the upper part of the hood a very deep recess, whereby evidently protection against getting dirty or dusty of the inner machine elements and especially of the type lever segment is not ensured.

All these inconveniences are overcome by the invention, in that the locking device impedes the folding up of the hood only if this hood has already been somewhat opened after the pulling back of the locking device. As the opening of the hood is effected by the action of a spring, the hood folds up in the device according to the invention without any further manipulation directly after the push-knob locking has been released, if the carriage is in a position in which the projecting elements of the carriage no longer prevent folding up of the hood.

This is attained according to the invention in that the locking lever controlled by the carriage in known manner is pulled back only when an unimpeded folding up of the hood is ensured.

In order to obtain in this arrangement a free access to the inner machine elements and to make as small as possible the recess for the passage of the type levers, the covering hood is oscillatably mounted on a lever hinged on the frame of the typewriting machine and having a slot-guiding, in which a lever engages which is mounted on the typewriting machine frame and also guided in the slot guiding fixed on the hood.

When the locking device which holds the covering hood in the closed position is unlocked, first a parallel movement of the hood takes place until the locking device prevents a further folding up of the hood. This movement is only so great, that in spite of the partly folding up of the hood the free movement of the carriage is not impeded. If the locking device is automatically unlocked after the carriage has been pushed back, the hood opens completely, in that it carries out in the first portion of its further travel a parallel movement and in the last portion an oscillating movement. The hood can be closed by a simple pressure. The lever hinged on the frame of the typewriting machine and guided in the two slot guides is under the action of a spring which effects the folding up, whereas the locking device engages behind a projection of this lever. By this invention a very good accessibility of the elements below the hood is attained. This is possible even if the hood is opened by a smaller angle than has become known up to the present. A separate recess for the insertion and removal of the ink ribbon is also no longer necessary, so that the recesses in the hood need only be very small. In this manner the screening of the inner elements, especially of the type lever segment, against getting dusty and dirty is attained almost completely. The provision of the slot guides permits further the obtention of any desired form of movement. For instance the hood can be lifted and at the same time oscillated, or the hood is first oscillated and then lifted.

The invention is illustrated by way of example in the accompanying drawings, in which

Fig. 1 shows the hood in section and in closed state,

Fig. 2 is a similar section as in Fig. 1 showing the hood in the position after the unlocking of the locking device but in locked state.

Fig. 3 is a similar section as in Fig. 1 the hood being open,

Fig. 4 shows in section a hood in closed state with slot guiding,

Fig. 5 is a section similar to that shown in Fig. 4 and shows the hood after the unlocking of the locking device but in still locked state,

Fig. 6 is a similar section as in Fig. 4 the hood being open,

Fig. 7 shows in elevation the locking lever controlled by the carriage in unlocked position,

Fig. 8 is a similar view as Fig. 7 but shows the locking lever in locking position,

Fig. 9 shows a detail of Figs. 7 and 8,

Fig. 10 shows the folded up hood in front elevation,

Fig. 11 shows in section the hood with sliding guide in closed state,

Fig. 12 is a similar section as Fig. 11 and shows the hood in the position after unlocking of the locking device but in still locked state,

Fig. 13 is a similar section as Fig. 11 the hood being folded up,

Fig. 14 shows the locking device according to Figs. 11 to 13.

In the several figures the carriage is designated by **1**, the platen by **2**, the return lever for the carriage by **3**, and the covering hood by **4**.

As shown in Figs. 1 to 3, the covering hood **4** is mounted on bearing brackets **6** and **7** fixed by screws on either side of frame **5** of the typewriting machine. A two-armed lever **9**, **10** is fixed at **8** on the hood **4**, and controlled by a spring **11**. The arm **10** of this lever has a projection **12** under which a locking lever **13** can engage. The shaft **15** of the locking lever **13** is journalled at **14** in the machine frame **5**. A roller **16** is eccentrically mounted on shaft **15** and adapted to roll on a bar **17** mounted on the carriage **1**.

A push knob **18** is provided in the machine frame **5** and acted upon by a spring **19** and engages behind a hook **20** (Fig. 2) fixed on hood **4**.

The device operates as follows:

The covering hood **4** is held in the closed position shown in Fig. 1 by the locking device **18**, **19**, **20**. If then a pressure is exerted upon the push knob **18**, the locking **19**, **20** is unlocked. As long as the return lever **3** of the carriage or other projecting elements of the carriage are above the hood **4** and would prevent folding up of the hood, the roller **16** has run up the bar **17**, as shown in Figs. 7 and 8, so that the locking lever **13** is below the projection **12** of lever **10**, as shown in Fig. 2, and thereby prevents a further folding up of hood **4** under the action of spring **11**. If the carriage is brought into the position shown in Fig. 7, in Fig. 9 in dash dot lines, the locking lever **13** liberates the projection **12** and the spring **11** effects the complete folding up of hood **3**, as shown in Fig. 3.

In the device illustrated in Figs. 4 to 6 and 10, the covering hood **4** is mounted at **21** on the outer hinge levers **22** which are pivotally mounted in bearing bodies **24** fixed on either side of the machine frame **5**. The outer hinge levers **22** have slots **23**. The inner hinge levers **26** are oscillatably mounted at **25** on the bearing bodies **24** and controlled by opening springs **11**. Each hinge lever **26** has a pin **27** which engages in the slot **23** of the corresponding outer hinge lever **22** and can slide in this slot. The inner hinge levers **26** have further each a pin **28** at its end which can slide in a corresponding longitudinal slot **29** of a control bar **30** fixed on the hood. One of the inner hinge levers **26** has a projection **31** under which the locking lever **13** engages in the locking position, said lever being controlled by the action of a spring **32**, as shown in Fig. 9.

This device operates as follows:

When the push knob **18** (Fig. 4) is depressed, the hood **4** is raised by the action of spring **11** into the position shown in Fig. 5, as the locking lever **13** which bears against the projection **31** of lever **26** prevents further opening of the hood **4** until the roller **16** has run off the control bar **17** of the carriage **1**. As can be seen from Fig. 5, the movement is at first a parallel movement owing to the slot guiding of the individual levers. As soon as the roller **16** has run off the control bar **17**, the locking **13**, **31** is unlocked and the hood can open completely. The hood then carries out in the form of construction shown at first a further parallel movement and finally folds up at the end of this movement.

Figs. 6 and 10 show clearly that by this folding up an absolutely free access is ensured to the elements of the machine which are otherwise covered by the hood. Consequently, the hood **4** need have only a small recess **33***a* (Fig. 10) so that an extensive covering of the inner mechanism of the typewriting machine is attained.

If another curved shape is given to the slot guides **23**, **29**, any desired movements of the covering hood can be obtained. It is evidently immaterial, whether the locking lever **13** engages on one of the moving elements or on the hood itself.

In the device illustrated in Figs. 11 to 14, the covering hood **4** is mounted on the arm **33** of a slidable piece **34** and **35**. The slidable piece **34** is guided on frame **5** of the typewriting machine in a guide **36** and controlled by a pull spring **37**. A lever **38** is further pivotally connected with the hood and has a locking projection **39**. This lever **38** is controlled by the action of a pull spring **40**. In the locked state a nose **41** of the locking lever **13** engages over the projection **39**, said locking lever being otherwise constructed in a similar manner as shown in the above described Figures. The lever **38** is conducted in the first portion of its movement by means of a pin **43** on a plate **42** against which it is pressed by the action of the spring **40**. The plate **42** has on its upper portion a curved path **44** along which the pin **43** slides after the lever **38** has been sufficiently lifted.

The device operates as follows:

After unlocking the locking device **18**, **19**, **20**, the hood **4** is lifted by the action of spring **37** until nose **41** of the locking lever **13** strikes against nose **39** of the oscillatable lever **13**, as shown in Fig. 12. If then in accordance with the position of the carriage **1** the roller **16** runs off bar **17**, the nose **41** of lever **13** slips off the nose **39** of lever **38**, and by the action of spring **37** the pivot pin **35** of the hood **4** is raised until pin **43** has reached the upper end of the guide plate **42** and then carries out an oscillating movement along the curved path **44** by the action of spring **40**. Owing to the rigid connection with the hood **4**, this hood is folded up.

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F. WUNDERLICH
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4 Sheets-Sheet 1

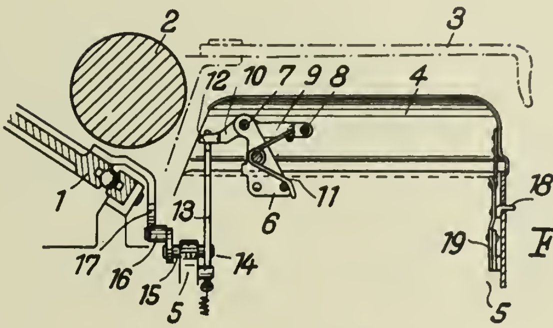

Fig.1

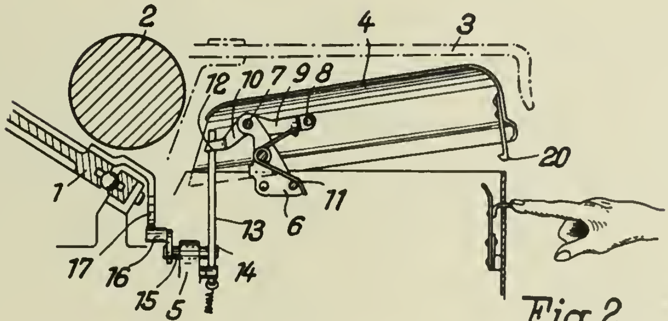

Fig.2

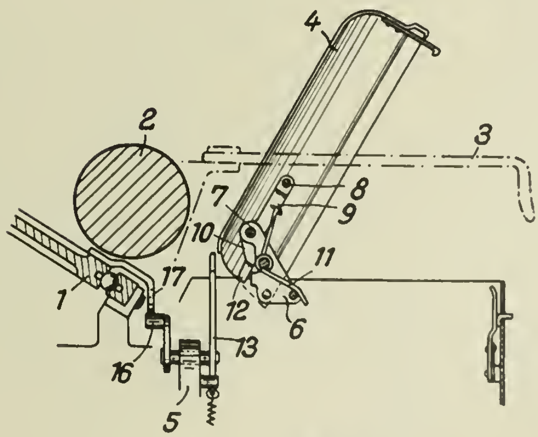

Fig.3

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4 Sheets-Sheet 2

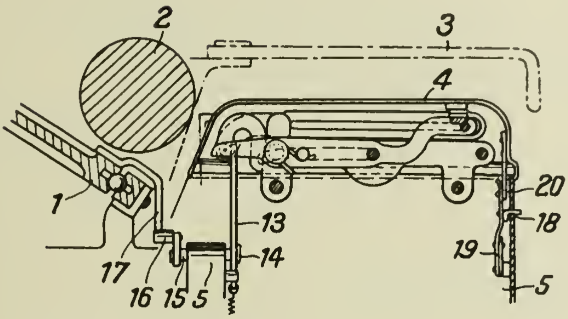


Fig.4

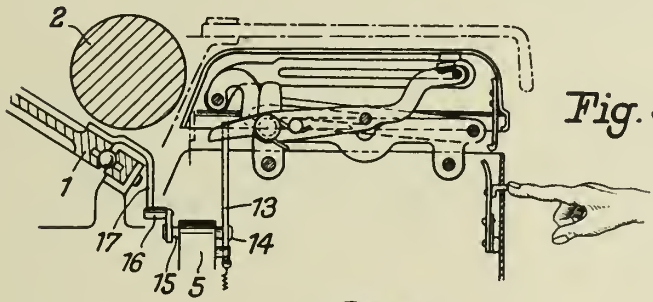
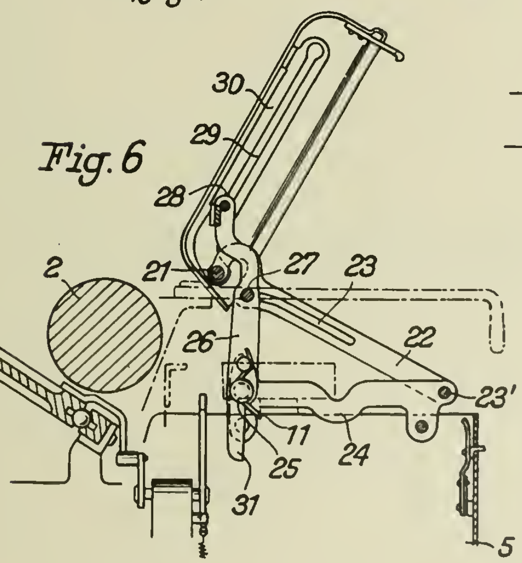


Fig. 5

Fig. 6



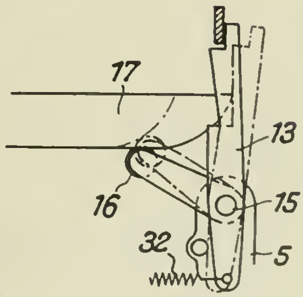


Fig.9

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4 Sheets-Sheet 3

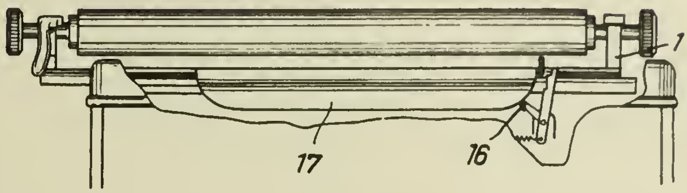

Fig. 7

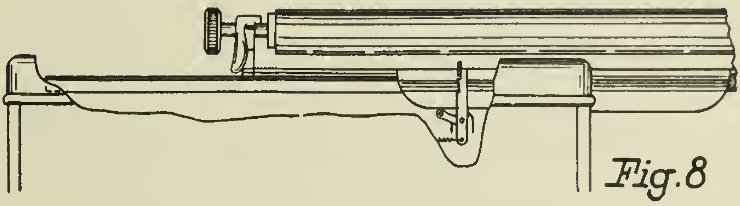

Fig. 8

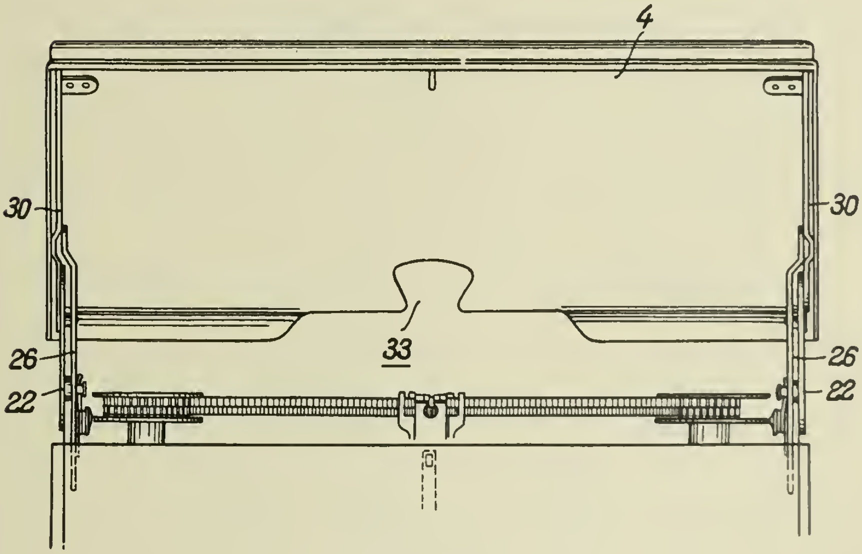

Fig. 10

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MAY 18, 1943.
BY A. P. C.

F. WUNDERLICH
TYPEWRITING MACHINE WITH COVERING HOOD
ADAPTED TO BE FOLDED UP
Filed Jan. 28, 1941

Serial No.
376,398

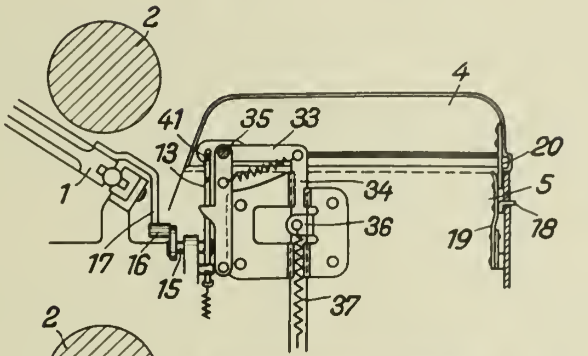

Fig. 11

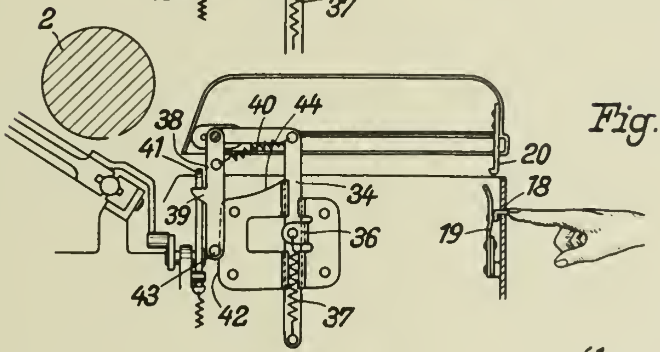

Fig. 12

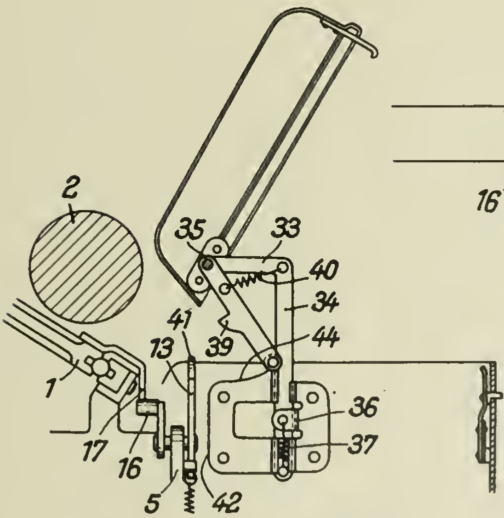

Fig. 13

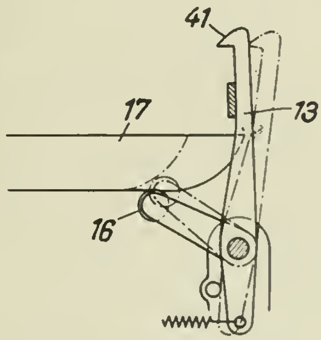

Fig. 14

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ALIEN PROPERTY CUSTODIAN

TELEGRAPHIC TRANSMISSION OF INTELLIGENCE OVER SUBMARINE CABLES

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Application filed January 30, 1941

This invention relates to a connection for the telegraphic transmission of intelligence over submarine cables.

For the telegraphic transmission of intelligence over submarine cables highly sensitive relays are, as a rule, employed at the receiving side. The correction of the length of the telegraphic signals in the case of long lines requires, particularly when high line speeds are necessary such an attenuation of the amplitudes of the receiving signals that the sensitiveness of the usual telegraph relays is not sufficient so that the use of amplifiers is indispensable.

It is well known in the art to employ inductively coupled amplifiers. In this case, however, the exact contour of the receiving signals is impaired by limiting the frequency band, particularly by the suppression of the direct current.

Also as to the distortion-correction phase shifters difficulties are, in general, encountered. In the case of a direct galvanic connection of the circuits—necessary for the correction of the attenuation and/or of the duration of transmission—with the line the great drawback is, for instance, presented in that the terminal circuit of the networks depending upon the length and the construction of the line varies at the remote end within wide limits.

These drawbacks are eliminated by the invention in an efficient manner. The arrangement according to the invention for the telegraphic transmission of intelligence over submarine cables is characterized by the fact that a dry rectifier modulator which translates the incoming telegraphic signals in a range of higher frequency is galvanically connected to the end of the cable that after amplification a retranslation in a range of low frequency is effected and that the distortion-correction phase shifting networks required are connected to the output of the amplifier. Also the transmitting side is preferably designed in a corresponding manner. At the transmitting side a translation in a range of high frequency is therefore effected and then after amplification a translation in a range of low frequency is again effected within a dry rectifier modulator galvanically connected to the cable line.

With the connection according to the invention it is possible to attain a satisfactory reception without the necessity of limiting the frequency band. A particular advantage of the distortion-correction networks lies in the fact that the current flowing in the terminal circuit of these networks remains constant.

The connection according to the invention is disadvantageous in that the faults which must be reckoned with to a great extent on the long cable line are also amplified, whereby the reception is impaired. This drawback is removed according to the invention by feeding back the output of the amplifier at the amplifier input in such a manner that the amplifier oscillates with the frequency of the telegraphic signals.

The telegraphic direct voltage applied to the output of the demodulator is fed back at the input of the amplifier through an auxiliary modulator. A phase-shifting network, by means of which the frequency may be adapted to the regenerative oscillations of the telegraphic frequency is preferably inserted in the regenerative path.

According to the invention a direct-current series amplifier is arranged between the receiving end of the line and the regenerative amplifiers in order to avoid a variation of the natural frequency of the amplifier by the changes of the line due to impedance. The amplifier consists in a corresponding manner of a modulator, the amplifier proper and of the demodulator.

An arrangement has already been proposed in which the sensitive relay provided at the receiving end is caused to oscillate in accordance with the telegraphic frequency. This arrangement is known as a Gulstad or vibration relay. Since owing to the high line loss the short current impulses are reproduced with a very small amplitude, whereas the + or − long current impulses (combined impulses) generally arrive with a great amplitude also the small amplitudes of the + or − short current impulses may be properly reproduced at the receiver by oscillating the relay according to the + or − short current impulses. If longer current impulses arrive the oscillations are suppressed in the Gulstad relay. The Gulstad relay has the disadvantage that the sensitiveness is not sufficient in the case of very long lines and that mechanical intermediate members, such as relay armatures and contacts which are subjected to tear and wear, are necessary for producing the natural frequency.

In the accompanying drawings as shown some embodiments of a connection according to the invention in diagrammatic form.

Fig. 1 shows a connection with an amplifier not fed back. The individual parts of the amplifier are schematically shown.

Fig. 2 shows an embodiment with an amplifier fed back.

Fig. 3 shows a series amplifier corresponding to the arrangement shown in Fig. 2.

Referring to Fig. 1 the telegraph receiver E is connected through the translating device shown to the submarine cable K together with the grounded balancing network. Both the modulator M directly connected to the cable and the modulator (demodulator) D which effects a translation in the low-frequency range are designed, for instance, in the form of ring modulators. The two modulators are particularly fed with a current having the same carrier frequency F. The distortion-correction network E arranged at the output of the amplifier V is preferably located behind the modulator D*r*. The transmitting side S is connected to the submarine cable through the distortion-correction network E', the modulator M', the amplifier V' and the dry rectifier modulator (demodulator) D'. Both modulators are preferably designed in the same manner, particularly as ring modulators. Also in this case the same carrier frequency F' is utilized for the two modulations and may be identical to the frequency F. As will be seen from the drawing the transmitter is connected to the cable in the usual manner through the circuits RC, RC' and through a potentiometer P in order to enable a duplex operation.

Fig. 2 shows a connection with a rectifier fed back.

The receiving end of the cable is connected to the terminals 1 and 2 of the ring modulator M shown in Fig. 1. The modulator M is provided with four dry rectifiers G1 to G4, an input repeater E and an output repeater A*m* with three windings. If an alternating voltage is applied to the primary winding P of the input repeater E and if direct-current telegraphic signals arrive over the terminals 1 and 2 the alternating currents in the output repeater A vary their phase in accordance with the telegraphic signals and are amplified by the amplifier V. In the output circuit of the amplifier V is inserted a demodulator D designed in the same manner as the modulator M. The amplified alternating currents flow from the amplifier V into the input repeater E' of the demodulator D, by means of which the alternating-current signals are retranslated in direct-current signals, provided that an alternating current of the same frequency and position of phase is supplied to the repeater U as is supplied to the modulator M. The direct-current signals which leave the demodulator D are supplied to the receiving relays R through a distortion-correction network Z. Behind the network Z a portion of the direct voltage produced is shunted off and supplied to a potentiometer S*p* from which is tapped off a part voltage which is supplied to the auxiliary modulator M*p* through a phase-shifting circuit P*h*. The auxiliary modulator M*p* is designed in the same manner as the modulator M or demodulator D. The direct-current signals tapped off are translated by the auxiliary modulator M*p* again in alternating-current signals and fed back at the grid of the amplifier by means of the third winding of the output repeater E. The degree of the back coupling is such that the amplifier V is caused to oscillate. The frequency of the regenerative oscillations is determined by the phase-shifting circuit P*h* and is so chosen that it corresponds to the telegraphic frequency.

The connection shown in Fig. 3 differs from that shown in Fig. 2 in that a direct-current series amplifier is connected in series with the amplifier V fed back. The reference numerals of this Fig. 3 denote the same parts as those of Fig. 2. The direct-current signals taken from the cables at the receiving end are converted at first by the modulator MV in the series amplifier in alternating currents, the alternating currents are amplified in the series amplifier VV, then demodulated in the demodulator DV and finally the direct-current signals produced are supplied to the main amplifier in the manner described above. The series connection of the series amplifier has the advantage that changes in the resistance of the line, for instance, influences of the temperature etc. cannot cause any change in the natural frequency of the regenerative amplifier. If this precaution should not be taken it might happen that in the connection shown in Fig. 1 the resistance of the line reacts on the amplifier input through the modulator M and changes the terminal circuit of the network P*h* determining the regenerative frequency.

HEINRICH FÜLLING.

PUBLISHED

MAY 18, 1943.

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TELEGRAPHIC TRANSMISSION OF INTELLIGENCE OVER SUBMARINE CABLES

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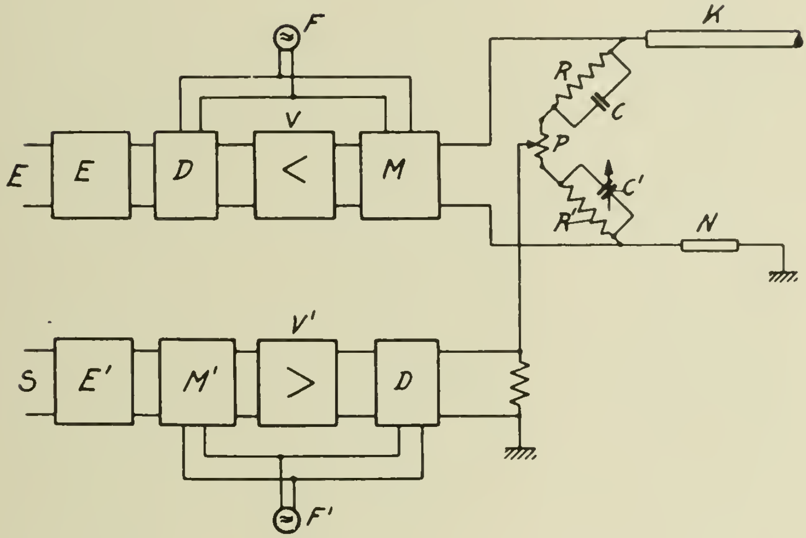
2 Sheets-Sheet 1

Fig. 1



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Att'ys

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TELEGRAPHIC TRANSMISSION OF INTELLIGENCE
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2 Sheets-Sheet 2

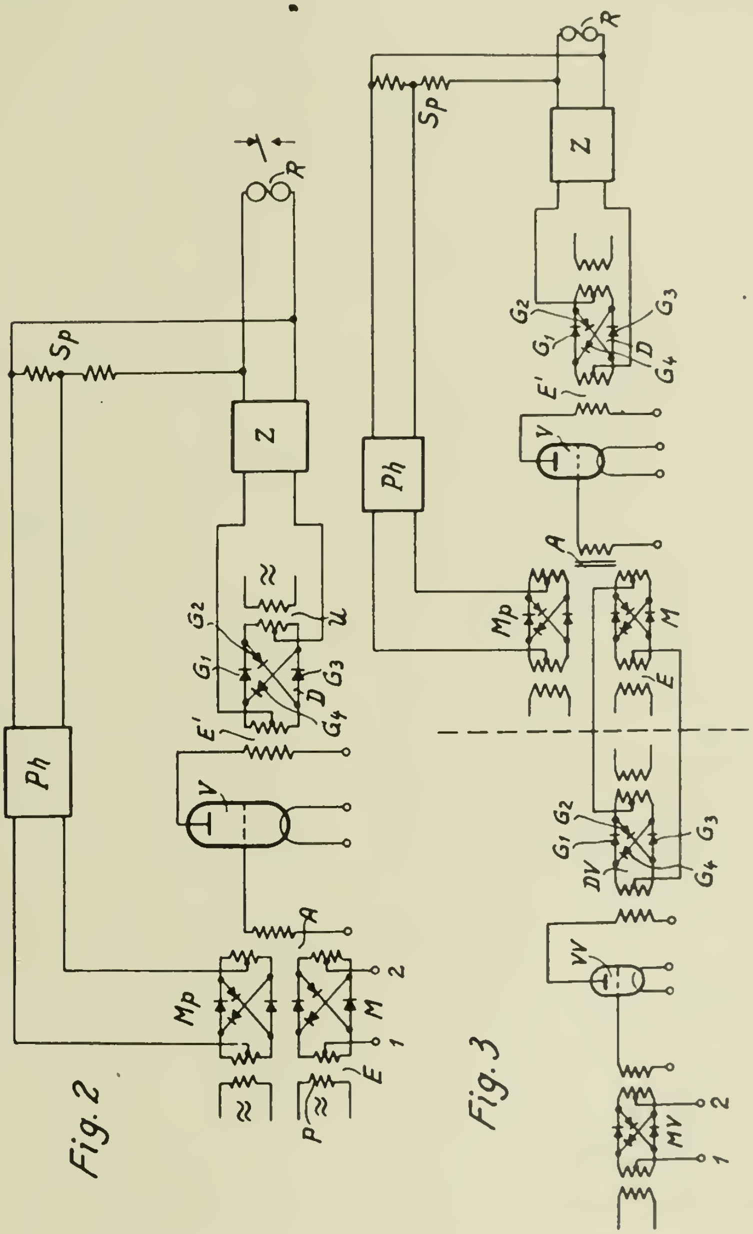

Fig. 2

Fig. 3

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ALIEN PROPERTY CUSTODIAN

WELDING CONTROL SYSTEM

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Application filed February 4, 1941

The present invention pertains to means for controlling the duration of welding currents and this application is a division of our application Serial No. 279,218 filed June 14, 1939.

The present invention relates to apparatus wherein use is made of a time switch consisting of one or more grid-controlled gas or vapor discharge tubes which are inserted in the excitation circuit of the medium or high frequency current generator feeding a medium or high frequency welding transformer. The contacts of the mechanical switches are arranged in the grid-controlled circuits of the tubes and, owing to the small switching power of these circuits, there is not produced any substantial electric arcing or burning, so that even energy impulses of very short duration can be accurately determined. In this way the speed of the variation of the generator field becomes of increased importance, more particularly in the case of light metal spot and seam welding, since it is the speed which sets a limit to the shortening of the duration of the energy in the case of full generator power.

In carrying out the invention use is preferably made of a source of alternating current voltage for the excitation of the medium or high frequency generator and of a gas or vapor discharge tube for the time switch. It is an advantage to use for the switching on or off of the alternating current circuit of the excitation of the medium or high frequency current generator one or more grid-controlled gas or vapor discharge tubes, in which one or more auxiliary electric arcs are employed. The switching on of the exciting current circuit is effected by applying a positive voltage to the grid, and a switching off thereof is effected by applying a negative voltage to the grid.

In the arrangement according to the present invention, only a small fraction of power has to be switched on and off. More particularly the switching tube is very small, so that the welding apparatus can easily be transported. Moreover, by the means described, medium and high frequency currents can be indirectly switched on and off, which can be carried out with the known welding timing arrangements, only up to a few hundred cycles per second. The use of higher frequency means that a smaller and lighter welding transformer can be employed, which can in many cases then be brought nearer to the welding point, whereby a further economy in power is effected. The simplicity of this new arrangement will be apparent from the diagram of connections.

Referring to the accompanying drawings, the invention is illustrated by way of example in which:

Fig. 1 is a diagram of connections of an electrical welding installation comprising a medium or high frequency welding generator excited from a source of alternating current through a rectifier serving at the same time as a switch;

Fig. 2 illustrates the welding operation; and

Fig. 3 shows a diagram of connections of spot and seam welding apparatus.

The drawing shows a medium or high frequency impulse generator used in a resistance welding installation, in which the magnetic circuits are constituted throughout by laminated iron, and in which the excitation current is derived from a source of alternating current voltage.

Fig. 1 illustrates an arrangement which is used when alternating current voltage is available for the excitation. The two electrodes **3** and **4** rest on two metal sheets **1** and **2** to be welded together. The electrodes are connected to the secondary winding **5** of a welding transformer **6**. The primary winding **7** carrying the higher voltage is connected to the armature winding **8** of the welding generator **9** driven by the motor **10**.

The excitation winding **11** of the welding generator **9** which is provided throughout with magnetic circuits constituted by laminated iron is connected through a resistance **12** with one end to the cathode **13** of a discharge tube **14**, and at the other end to the star point of the secondary windings **15**, **16** and **17** of a transformer **18**, such as a three-phase transformer. The other ends of the secondary winding lead to the three anodes **19**, **20** and **21** of the discharge tube **14**. The primary windings **22**, **23** and **24** of the transformer **18** are connected either to an existing three-phase network or to a three-phase generator which may be mechanically coupled to the driving motor **10**.

Two auxiliary anodes **25** and **26** of the tube **14** are used for auxiliary electric arcs which are fed by the lower voltage winding of the auxiliary transformer **28**. The tapping on the lower voltage winding is connected through an auxiliary discharge circuit cathode choke **29** and through a regulating resistance **30** to the cathode **13** of the discharge tube **14**. In order to start the auxiliary electric arcs use may be made of a starting pin **31**, which is connected through a regulating resistance **32** and switch **33** at one of the two ends of the lower voltage winding of the auxiliary transformer **28**.

The three controlling grids 34, 35 and 36 are connected through grid resistances 37, 38 and 39 and the regulating resistance 40 connected to the source of grid voltage 41 so as to be biased to a stopping potential which is negative with respect to the cathode. The positive terminal of the source of grid voltage is connected to the cathode 13 of the discharge tube 14.

If the main discharge is to be started and the welding generator 9 be thereby excited, the switch 42 is operated, whereby a circuit is closed which includes a positive terminal of the source of grid voltage 43, an adjustable condenser 44, the regulating resistance 40, negative terminal of the source of grid voltage 41, positive terminal of the source of grid voltage 41, negative terminal of the source of grid voltage 43. At the first moment the voltage on the condenser 44 is nil, whereby the grids 34, 35 and 36 are operated beyond the limit of grid voltage in a positive direction, thus starting the main discharge in the tube 14 ionised by the auxiliary electric arc. As soon the voltage on the condenser 44 has increased to such an extent that the grid voltage drops again below the value of the limit of the grid voltage, the discharge no longer takes place towards the anode of the next following phase but is extinguished at the anode which was last operated in the next following passage of current. By varying the capacity 44 or the resistance 40 control of the duration of the main discharge and thereby the period of welding can be obtained.

Referring to Fig. 2, the hatched surfaces show the energy impulses serving for the welding, and the abscissae represent time. The duration of the impulse is indicated at S and P is the duration of the interval between the individual energy impulses. One operation is represented by SP. In the present spot and seam welding apparatus the duration S of the energy impulse and the duration of one operation SP are regulated by purely electrical means.

Fig. 3 shows the diagram of connections of a spot and seam welding apparatus, the reference numerals 1 to 41 referring to the same parts as those described with reference to Fig. 1. The regulating device for the regulation of the duration S of the energy impulse and of the duration of one operation SP consists of a tube switching arrangement of three tubes 42*a*, 47 and 51, of which 51 and 47 are gas-filled and 42*a* is an electron tube having a very steep anode current characteristic. The tube 51 together with the resistance 54 and the condenser 53 constitute a saw-oscillation circuit. Apart from the voltage of the source of current 59, the saw-oscillation voltage is dependent on the starting voltage of the tube 51 and, therefore, on the grid voltage 52 of this tube. This grid voltage 52 is composed of the voltages of the transformer 56 and battery 58. Owing to saturation the transformer 56 has a voltage curve which is very pointed. The battery voltage 58 is made so strongly negative that the tube 51 starts only when the condenser 53 is charged to the voltage of the source of current 59 and when the voltage of the transformer 56 attains its maximum positive value. In this way it is attained that the tube 51 always starts at a definite moment with respect to the alternating current voltage of the network. This starting moment is preferably so chosen by means of a capacity resistance circuit 57, that a grid of the main rectifier 14 becomes positive exactly when the voltage at the corresponding anode passes through zero at the beginning of the positive half wave.

As soon as the tube 51 starts after the closing of the switch 61 in the manner described, the discharge current of the condenser 53 flows through the transformer 50 through which the grid 48 of the tube 47 is coupled to the saw-oscillation circuit. Normally the grid 48 is made so negative that no current flows through the tube 47. During the discharge in the saw-oscillation circuit the grid 48 becomes positive and a current flows from the positive pole of the battery 59 through the resistance 46, transformer 61, condenser 43*a* and tube 47 back to the negative terminal of the battery 59 and the condenser 43*a* is charged. During the flow of current through the coupling transformer 61, the grid 44*a* of the tube 42*a* becomes negative and the tube 42*a* is thus stopped. As soon as the charging of the condenser 43*a* is terminated the grid 44*a* of the tube 42*a* is again de-energized, and the condenser 43*a* is discharged through the resistance 40 and tube 42*a*. Owing to the voltage drop on the resistance 40, the grids 34, 35 and 36 of the main rectifier 14, which are otherwise negatively charged by the battery, become positive and the main rectifier starts and is operative until the grids 34, 35 and 36 become again negative after the discharge of the condenser 43*a*.

The operation hereinbefore described is repeated in the tempo of the saw-oscillation frequency of the first tube circuit, which frequency can be regulated by means of the resistance 54 and condenser 53. The ignition time of the rectifier 14 is determined by the time constant of the circuit constituted by the resistance 40 and condenser 43*a*. The saw-oscillation frequency determines the period of operation and the ignition time the duration of the energy impulse. Thus the arrangement described permits of the impulse and duration of operation to be regulated and periodically repeated by purely electrical means.

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G. HAGEDORN ET AL
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2 Sheets-Sheet 1

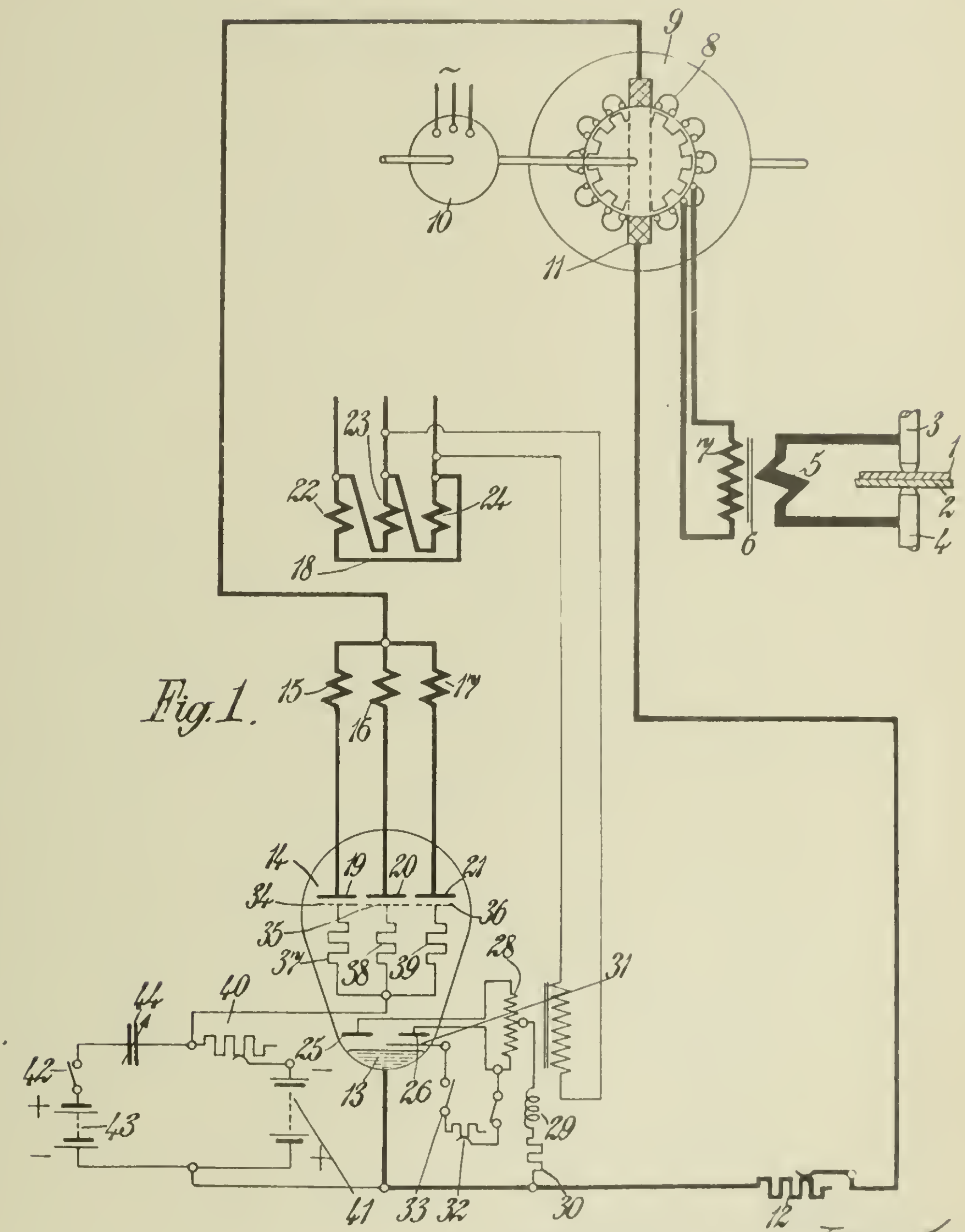

Fig. 1.

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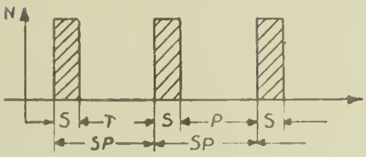

Fig. 2

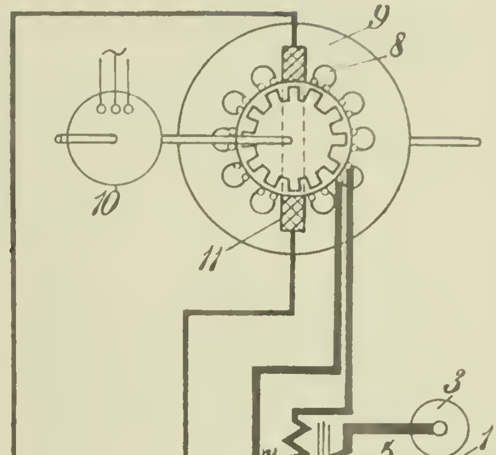
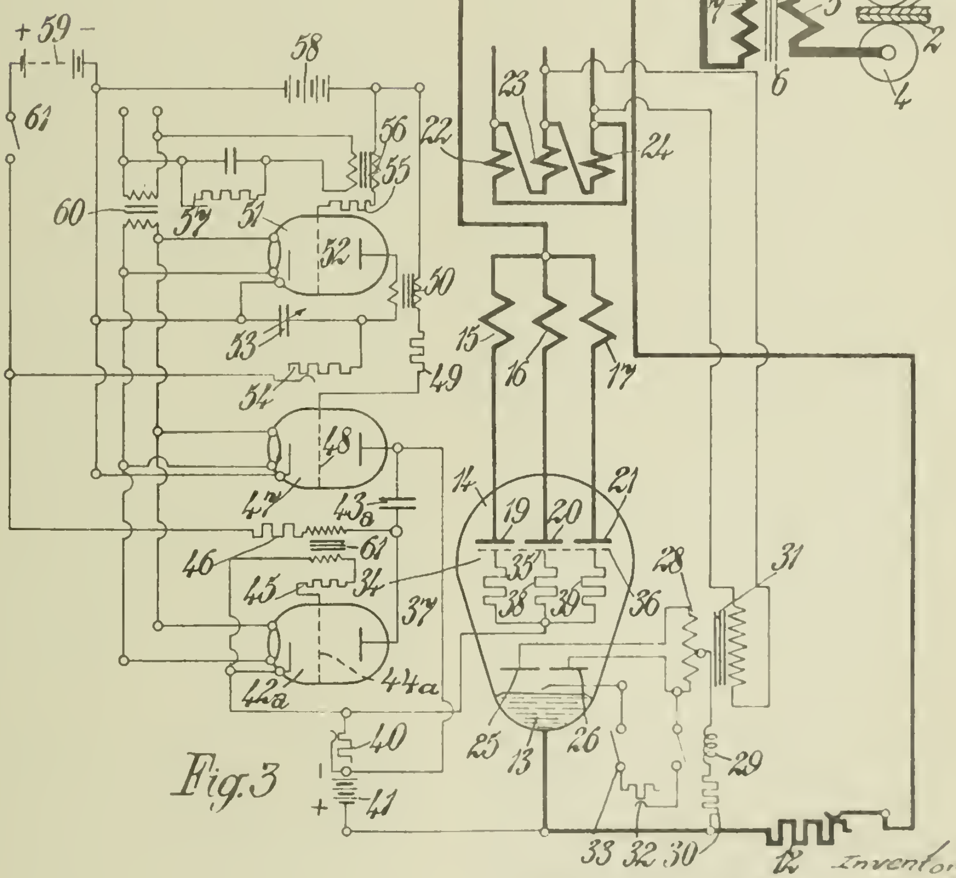

Fig. 3

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ALIEN PROPERTY CUSTODIAN

NONMETALLIC ELECTRIC RESISTANCE MATERIAL AND PROCESS FOR PRODUCING SAME

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No Drawing. Application filed February 5, 1941

This invention relates to nonmetallic electric resistance material and to a process for producing same.

It is known to produce electric resistance materials from oxides and mixtures of oxides and also to use certain complex combinations, particularly ferrosoferric oxide, or magnetite, either by itself or with admixtures of resistance increasing substances like light metal compounds, ceramic masses, etc., as resistance material. It has further been proposed to employ for this purpose substances which can be derived in the form of salts from acids consisting chiefly of the higher stages of oxidation of metals, as copper chromate. Current conducting minerals like magnetite, red zinc ore, iron glance, iron pyrites, etc. have been used also. It has been found, however, that apart from the metallic carbides and, above all, silicon carbide, which do not constitute oxygen compounds and at higher temperatures succumb to the attack of atmospheric oxygen, these proposals have not yet brought about any practical success. Experiments may further be mentioned to combine metal powders mixed with ceramic masses, as clay, kaolin, etc., into resistance masses, but the materials produced cannot withstand any appreciable loading by the electric current.

It is the object of the invention to provide electric resistance materials consisting of synthetically prepared compounds of the spinel type formed by sintering oxides mixed at an accurate stoichiometric ratio, which at room temperature possess a degree of electric conductivity suitable for resistance purposes, or of a mixture of such compounds obtained by sintering them together and also distinguished by a suitable specific resistance.

Substances of the spinel type for producing stable, corrosion resisting ceramic resistance materials have been chosen chiefly for the reason that such spinels, besides their excellent thermal and frequently also electrical properties, possess the isomorphism due to the uniform character of the crystal lattice, which means that these substances may be mixed in all proportions to obtain perfectly homogeneous masses containing the original constituents mutually in solid solution. The result is that the mixtures of such substances of the spinel type are just as corrosion resisting as their components, i. e., that they do not vary their quality and structure if constantly subjected to the action of heat or, in other words, do not age.

Apart from the spinel itself, some of these substances occur in nature, though usually contaminated and with a few exceptions not in sufficient quantities. Contaminations, however, particularly those containing silicic acid, change the electric properties of these substances in a highly unfavorable manner and impair also corrosion resistance. For this reason, the invention makes use of synthetically prepared substances.

Substances of the spinel type are chemically perfectly well defined compounds of the formula

$$R^{II}O \cdot R_2^{III}O_3$$

R^{II} being a bivalent metal like Mg, Fe, Ti, Co, Cr, Zn, Cd and possibly also Cu, and R^{III} being a trivalent metal like Al, Ce, Fe, Ti, Cr, Mn. Their fundamental type is spinel proper, i. e. $MgO \cdot Al_2O_3$. Substances possessing spinel character show valuable physical properties including practicularly high constancy of temperature.

One of the commonest minerals of spinel type is magnetite, $Fe(Fe_2O_4)$, which in its synthetic form as ferrosoferric oxide has been proposed already as suited for resistance purposes and in its unmixed form is therefore disregarded by the present invention, because its conductivity in this condition is much too high for resistance. It has been attempted to impart a higher specific resistance to ferrosoferric oxide or magnetite by nonconducting admixtures, as oxides, clay, steatite, etc., but this has led to no practical results, because such mixtures, even if heated to melting temperature, fail to yield solid solutions like the above-mentioned spinel mixtures. The resistance materials thus produced either lack stability as to temperature, even if heated to the melting point, since the melting temperature, particularly in case of siliceous admixtures like steatite, is at once reduced thereby several hundred degrees, or they corrode at any appreciable electrical load owing to their inhomogeneous composition and lack also those electrical properties that are required for practically useful resistances. The temperature coefficient of the specific resistance is strongly negative, and the resistance itself continually varies at constant temperature during the passage of the current until it is completely destroyed. Closer examination discloses the fact that the resistance mass is not uniform due to the juxtaposition of substances of different crystalline structure, and the added oxides in particular are usually present therein in free and unmixed condition and form nonconducting inclusions which produce destructive transfer resistances and arcing. Additions of siliceous substances form bisilicates, i. e. glas or slag streams.

which do not combine with the excess magnetite and produce similar effects as the oxide inclusions mentioned. In short, such mixtures lack the indispensable homogeneity. Similar experiments with a view to rendering magnetite suitable for resistance purposes have been made in larger numbers and are therefore not new. New, on the other hand, is the employment of mixtures of magnetite with other substances of the spinel type for resistance purposes, and herein resides the main feature of the invention.

When substances of the spinel type, briefly referred to below as "spinels", are examined as to their electrical properties, it will be found that only a few of the pure unmixed spinels yield useful resistance material, mostly because the specific resistance is not great enough, whereas by mixing such compounds in certain experimentally determined proportions resistance materials possessing excellent physical properties are obtained. The already mentioned isomorphism of the spinels insures such a high degree of homogeneity of the mixtures that the individual components thereof completely disappear and their physical properties undergo a change. This change takes place however, in a certain order within a mixture series comprising equal components, though in different proportions, so that after corresponding preparation the physical properties, particularly the melting point, the fusing temperature, the specific electric resistance and the temperature coefficient thereof can be accurately determined by experiment for each mixing proportion. As these physical properties continually vary with the mixing proportion, it is possible after adopting a principle, as a formula, table or curve, accurately to determine the resistance conditions for each mixture series from the very start, or to find in each instance, if the dimensions of the resistance body required are known, the mixture possessing the desired absolute resistance at a predetermined operating temperature of the resistance material.

Synthetic spinels can be produced in the simplest manner from the oxides serving as initial material by sintering. However, as sintering by mere mixing of the oxides concerned and their subsequent heating is successful only in rare instances, various steps are required for chemically combining the elements. One of these steps consists in forming the finely crushed and well mixed constituents into briquettes. The stoichiometrically accurately weighed in constituents are intimately mixed and with the aid of a binding agent like dextrin, sulfit liquor, etc. which can be completely removed again by heating pressed into plain firm bodies, unless it is desired to impart to the pressed masses their final shape already at this step. Having been dried, the bodies are sintered at a temperature slightly below the melting point of the finished spinel and usually quite high, which in every instance has to be found out by experience. Sometimes, and particularly if easily dissociable (CuO) or subliming ingredients (CdO, ZnO) are contained in the mixture, sintering has to be carried out in stages. i. e., the temperature must be raised by steps. After the sintering process it is usual to crush the bodies again and to reshape them by pressing, drawing, etc.

An easier procedure comprises preparatory sintering by means of fluxes, since in this case the sintering temperature can be kept far below the sintering temperature proper. In this respect, there are four different kinds of fluxed: In the first place, those that can be dissolved out again by a solvent, mostly water, after sintering; secondly, those that can be evaporated again after sintering by a subsequent rise in temperature; thirdly, those whose admixture has no detrimental effect upon the physical properties of the elements, especially resistance and temperature coefficient, and which may therefore remain in the mixture; and fourthly, those whose harmful ingredients can be removed by subsequent heat treatment or during sintering.

To the first class of fluxes belong salts which have a correspondingly low melting point but do not decompose at the prevailing temperatures; they comprise, above all, alkali salts, as sodium chloride, potassium sulfate, etc. The sintering temperature lies slightly above the melting point of the salts and is always such as to cause only little decomposition or none at all. When sintering has been performed, the flux is dissolved out with the aid of water soluble salts, as water, during which process the mass disintegrates or at least softens and can be easily crushed. The spinels are thus obtained in finest crystalline condition. Further shaping to produce resistance bodies, which includes subsequent sintering, is performed in known manner as stated above.

The fluxes of the second class comprise easily fusible or easily vaporizable metallic oxides like PbO, Bi_2O_3 which frequently permit perfect sintering already at a temperature of somewhat above 1,000° C. Their retention in the resistance mass has, however, a detrimental effect upon their thermal and particularly their electric behavior, so that it is advisable to vaporize them out again by suitable heat treatment, in which case the temperature may remain far below the sintering temperature of the pure spinel mass.

The third class of fluxes mentioned are those that may either form a constituent of a compound of the spinel type or that do not act detrimentally even in isolated condition, since they are good conductors themselves. An example is cadmium oxide which is a good conductor per se and in sintered condition will stand temperatures far above 1,500° C. and which on the other hand, at a little over 1,200° C., forms cadmium ferrite with iron oxide, which is a compound of the spinel type.

Of the fluxes of the fourth class special mention deserve metallic compounds having a relatively low melting point. As they would detrimentally influence the thermal or electrical properties if they were to remain as such in the mass, their harmful portion is votalized by decomposition at corresponding temperatures. The remaining portion, an oxide, is either kept isolated in the mass or combines with another constituent of the mass to form a compound of the spinel type. Examples are the chlorides and nitrates of some heavy metals, which decompose at higher temperatures, the acid portion or the halogen escaping in gaseous form and the base remaining as oxide in the mixture and combining again in certain circumstances.

Finally, a simplified process for producing mixed spinels may be mentioned which is applicable when one substance of the spinel type is already present in finished condition and both constituents of the mixture are based on the same bivalent or trivalent oxide. In this instance, a double spinel can be prepared simply by adding another simple oxide. The following is an example:

A mixture of ferroferrite, $Fe(Fe_2O_4)$, and ferrochromite, $Fe(Cr_2O_4)$, is to be prepared. As

finished ferroferrite can be easily procured from hammer or mill scale, it suffices to add a corresponding amount of chromium oxide, Cr_2O_3, to obtain the mixture mentioned by sintering, since in this case a portion of the trivalent iron oxide in the ferroferrite is automatically reduced and with the chromium oxide forms ferrochromite. An example of the reversed case is the following: Manganous manganite is present, and zinc manganite is to be added as second substance. It is then only necessary to add zinc oxide to the manganous manganite and to sinter the mixture, which involves automatic oxidation of a portion of the bivalent manganic oxide (manganous oxide) to a trivalent one, so that finally a mixture of two spinels, zinc manganite and manganous manganite, is obtained.

The further treatment of the resistance masses up to the production of the finished resistance bodies is assumed to be known. Unless the first sintering operation producing the desired chemical compounds is to be directly combined with final shaping of the resistance bodies, for instance by imparting to the crude oxide mixtures the final shape of the resistance bodies by pressing, which in case of numerous mixtures can be done without trouble, the fusible masses are either cast into suitable molds or after preparatory disintegration provided with an appropriate binding agent and shaped as required by means of impression dies or an extruding press, whereupon they are subjected again to sintering during which operation the binding agent is removed.

When fluxes are used which would leave oxides in the resistance material, steps may be taken to insure subsequent conversion of these oxides into spinels. If the nature of the substances present is such that this conversion does not occur by itself, a certain amount of a second oxide that does not act as flux may be added to make sure that the flux is converted into a substance having spinel character. These processes may be illustrated by a few examples.

Assumed that ferrous aluminate, equal to black spinel or mineralogical hercynite, is used as fundamental substance in a resistance mass and cadmium oxide as flux, which acquires this quality already at somewhat above 1.000° C. whilst hercynite alone would sinter only at approximately 1.600° C. If to this mixture the accurately weighed quantity of iron oxide, (Fe_2O_3), required to combine with the cadmium oxide present to form cadmium ferrite is added, the peculiar property of the cadmium oxide to act as flux is at first not affected thereby. It "dissolves" the ferrous aluminate, that is, it produces sintering thereof already at about 1.200° C. However, during a rise in temperature to 1.280° C. within three hours, a corresponding amount of cadmium ferrite, the second substance of spinel type, is slowly formed while the iron oxide combines with the cadmium oxide which loses as intended its capacity to act as flux. The new mixture formed has then a fusing temperature of over 1.500° C. and may serve as resistance material up to this point.

If the fundamental substance is a mixture of ferrous aluminate and ferroferrite and cadmium oxide serves again as flux, sintering occurs at approximately 1.200° C. When after sintering the temperature is raised again to 1.280° C., the cadmium oxide is capable of splitting a corresponding amount of the ferroferrite present into FeO and Fe_2O_3, a portion of the cadmium oxide forming with the Fe_2O_3 cadmium ferrite, and the other portion does likewise with the FeO while atmospheric oxygen is absorbed. The following equation is probably applicable to the process:

$$2Fe(Fe_2O_4)+3CdO+O=3Cd(Fe_2O_4)$$

It is important to have the flux lose its characteristic as such, since the resistance will then be adapted for higher temperatures. The advantage afforded by the use of the flux is evident. Referring again to the example stated: Preparatory sintering with a water soluble flux brings about at first the chemical combination of the starting materials to form spinels at a temperature of only 1.000° C., and after shaping sintering can be completed with cadmium oxide at 1.200° C. In this way resistance bodies can be obtained which will withstand temperatures up to nearly 1.600° C.

KARL BIEFELD.

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ALIEN PROPERTY CUSTODIAN

POLARIZED RELAYS

Otto Römer, Berlin-Siemensstadt, Germany; vested in the Alien Property Custodian

Application filed February 6, 1941

This invention relates to improvements in polarized relays.

A polarized relay with divided permanent magnetic flux is well known in which the two permanent fluxes form a closed circuit through the ends of the armature, whereas the variable alternating flux passes transversely through the armature.

The known polarized relay presents the disadvantage in that a relatively large armature must be employed which is generally constantly saturated owing to the magnetic direct-current flux which forms a closed circuit through the ends of the armature. If the saturation of the armature should not be effected too rapidly, the cross-section of the armature must be made larger. However, this does not mean an increase in weight which cannot be put up with, particularly when designing a sensitive relay.

This drawback is removed according to the invention and a polarized relay is provided whose armature and therefore its cross-section is extremely small, since in this instance the polarizing permanent flux does not pass through the armature. According to the invention the permanent magnetic fluxes traverse in spaced relation from one another the armature ends in the transverse direction, whereas the alternating magnetic flux forms substantially a circuit through the ends of the armature.

It is of particular advantage to maintain two of the four air gaps constant. This may be accomplished by giving the armature a particular form, preferably by giving it an L-shaped cross-section.

In the accompanying drawings are shown three forms of the invention in diagrammatic form.

Fig. 1 shows the permanent magnet 1, the alternating flux core 2 and the armature 3. The permanent magnet is so shaped that the two permanent fluxes form a closed circuit through the ends of the armature 3. The flux circuit extends from the pole piece 4 of the permanent magnet 1 through the end 5 of the armature 3 to the pole piece 6 of the alternating-current core. The pole shoe 6 is arranged on the pole shoe 7 of the permanent magnet. The dotted circle and the arrow indicate the manner and direction of flow. The second permanent flux circuit extends from the pole piece 8 of the permanent magnet 1 through the other end 9 of the armature 3, the pole piece 10 of the alternating-flux core to the pole piece 11 of the permanent magnet 1. The permanent fluxes are therefore in spaced relation from one another and pass the ends of the armature in the transverse direction.

If the alternating flux core 2 is energized in a given direction by a coil (not shown) arranged on the limb 12, the flux circuit of the alternating flux core 2 extends from the pole piece 6 through the entire length of the armature to the pole piece 10 of the alternating flux core.

Fig. 2, in which the same reference characters denote corresponding parts of Fig. 1, shows an arrangement corresponding to that of Fig. 1 except that the flux supply air gaps (i. e., the air gaps through which the permanent fluxes enter the armature) remain constant despite the movement of the armature. This may be accomplished by giving the armature a predetermined shape, i. e., by designing the armature in this embodiment as an armature having an L-cross-section. Upon the movement of the armature only the working air gaps (i. e., the air gaps through which the alternating flux enters and leaves the armature) are varied.

A further advantage of the above-described embodiment consists in designing both the permanent magnet 1 and the alternating-flux core 2 of one piece, since both need only be given a U-shaped cross-section.

Fig. 3 shows another embodiment of the invention. In contradistinction to the above-described embodiments the permanent flux in this embodiment enters the armature at the pivot as indicated at 13 so that the permanent flux passes from the north pole designated by + through the air gap 14 into the armature 3 and divides itself at the armature pivot 13. The flux circuit extends on the one hand as indicated by the arrows from the armature pivot 13 to the end 5 of the armature through the air gap, the pole shoe of the alternating-flux circuit to the south pole 7 of the permanent magnet and on the other hand through the pivot 13, the other end 9 of the armature, the air gap, the pole piece 10 to the south pole of the permanent magnet. The alternating-flux circuit extends in the same manner as in the embodiment described above.

OTTO RÖMER.

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POLARIZED RELAYS
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Fig.1

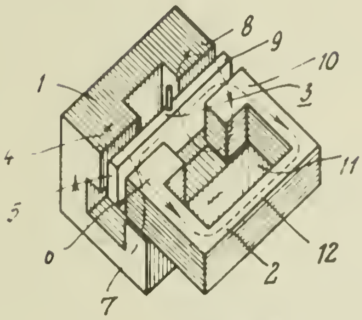


Fig.2

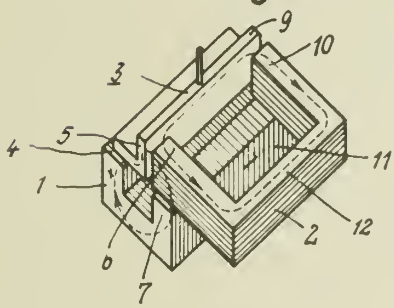
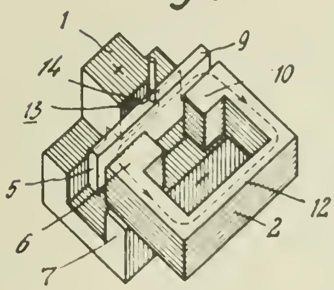


Fig.3



Inventor
Otto Römer
By

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Serial No. 377,720

ALIEN PROPERTY CUSTODIAN

POLARIZED SINGLE-COIL RELAYS

Otto Römer, Berlin - Siemensstadt, Germany; vested in the Alien Property Custodian

Application filed February 6, 1941

This invention relates to improvements in polarized single-coil relays.

A polarized single-coil relay with a divided direct-current flux forming a closed circuit through the ends of the armature is well known. In such a relay one pole of the polarizing permanent magnet is arranged in the neighborhood of the two pole shoes; the other pole of the permanent magnet is arranged below the center of rotation of the armature. Since in the known relay the armature must have a very short length, the distance between the poles of the permanent magnet must be chosen accordingly small. Since the attractive force of the permanent magnet is dependent upon its dimension a bar magnet of such a small length is not sufficient for the permanent flux. To attain a sufficient attractive force a horse-shoe magnet must be employed if the distance between the poles is dependent upon half the length of the armature and if the length of the armature is small. However, horse-shoe magnets of sufficient attractive force require large dimensions. Thus in the known relay it is necessary to arrange the horse-shoe magnet beneath the mounting plate of the relay so that the height of the mounting frame is dependent upon the height of the horse-shoe-shaped permanent magnet. Since the parts of the relay, such as the coil, the armature and the contact arrangement are arranged above the mounting plate and only the horse-shoe magnet is placed beneath this plate there results a hollow space beneath the mounting plate and within the mounting frame that cannot be utilized.

As the distance between the poles of the permanent magnet must be relatively small in view of the fact that the permanent magnet on the one hand is arranged below the center of rotation of the armature and on the other hand below the pole shoes of the alternating flux circuit and since the pole of the permanent magnet arranged below the center of rotation of the armature must be extended in the upward direction through pole shoes to the plane of the armature, the further disadvantage is presented in that between the permanent magnet arranged below the center of rotation of the armature and the pole shoes of the alternating flux circuit there remains a relatively small air gap so that the dispersion of the permanent magnet cannot be neglected.

The disadvantages of the known relay are removed according to the invention. The object of the invention is to provide a relay of the smallest dimensions.

According to the invention the permanent flux enters the soft iron circuit from a point lying on one side of the center of rotation of the armature and returns to the permanent magnet from the armature on the other side of the center of rotation of the armature.

According to the invention the permanent flux is carried off from the armature in a direction perpendicular to the movement of the armature. Such a measure has the advantage that a strong permanent magnet having a small dispersion may be mounted in the relay. Since in carrying off the flux according to the invention the production of a breaking torque is avoided also in the case of the smallest air gap, the flux may be carried off from the armature even in the neighborhood of the contacts.

The relay according to the invention has the further advantage that a permanent magnet of the bar type may be employed instead of a horse-shoe magnet, since the distance between the poles of the permanent magnet may be made equal to the length of the armature. However, since the armature is secured above the mounting plate as is the case with the known relays, an L-shaped permanent magnet is preferably employed, in which the pole arranged on the short end of the magnet is opposite to the point of the armature where the flux is carried off.

In Figs. 1 and 2 of the accompanying drawings is shown an embodiment of the invention in diagrammatic form, in which similar numerals denote similar parts in both views. Fig. 1 shows a side elevational view of the relay according to the invention and Fig. 2 a top view thereof.

The coil **2** and the soft iron armature **3** thereof are arranged within the casing frame **1** partly broken away. The soft iron core **3** forms a closed circuit through the pole shoes **4**, the air gap **5** being maintained constant in which one end of the resiliently mounted armature **6** oscillates. The armature **6** is secured to the clamping block **8** through the spring **7**. **9** denotes the axis of rotation of the armature. To the end of the armature **6** away from the soft iron pole shoes **4** are secured the contact springs **10** which contact with the stationary contact **12** secured to the contact block **11**. Between the center of rotation **9** of the armature and the contact making end of the armature are arranged beneath the armature **6** the surfaces **13** carrying off the flux. The polarizing permanent magnet **14** whose rear side lies in the same plane as the bottom plate of the casing frame is L-shaped. The shorter end of the magnet **14** denoted by the reference character S forms the south pole and is opposite to the surface **13**

of the armature 6, carrying off the flux. The long end of the permanent magnet 14 denoted by N forms the north pole of the permanent magnet and is arranged beneath the pole shoes 4. The screws 15 and 16 consisting of soft iron and whose invisible free ends contact with the north pole of the permanent magnet are embedded in the pole shoes 4. The alternating flux forms a closed circuit through the pole shoes 4 and through the armature end capable of being oscillated in the air gap. The permanent flux circuit extends from the north pole of the permanent magnet on the one hand through the screw 15 to one of the pole shoes 4 of the alternating flux circuit and from the other pole shoe 4 to the armature end capable of being oscillated in the air gap. The permanent flux forms a closed circuit through the ends of the armature and flows from the center of rotation 9 back into the south pole of the permanent magnet through the surface 13 carrying off the flux. On the other hand the permanent flux which divides itself extends from the north pole of the permanent magnet through the screw 16 to the other pole 4 of the alternating flux circuit and extends also through the ends of the armature and returns on the other side of the center of rotation 9 of the armature to the south pole of the permanent magnet through the surface 13 carrying off the flux.

OTTO RÖMER.

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O. RÖMER
POLARIZED SINGLE-COIL RELAYS
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Fig.1

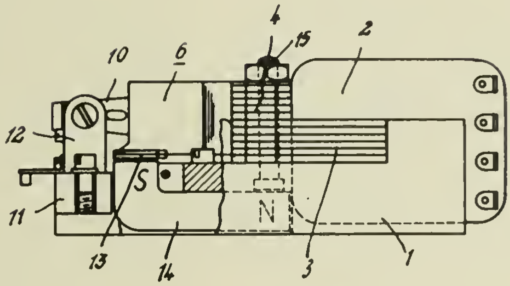
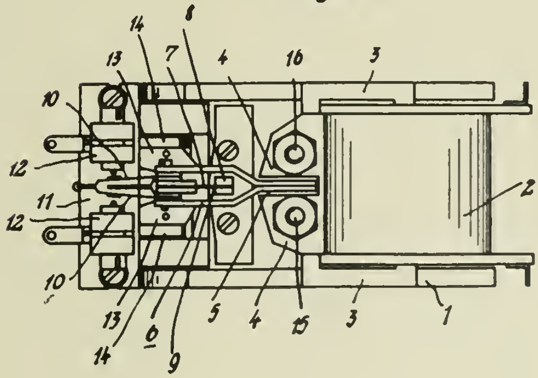


Fig.2



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462

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ALIEN PROPERTY CUSTODIAN

AUTOMOTIVE CENTRIFUGAL CLUTCH

Fritz Fiedler, Munieh, Germany; vested in the Alien Property Custodian

Applieation filed February 7, 1941

It is known to design friction clutches in which the pressure between the clutch elements produced by centrifugal weights increases in proportion to the engine speed. With low engine speeds the weights are prevented from swinging outwardly by springs so that the clutch is prevented from being engaged. Only when the rotational speed is increased, the weights are swung outwardly against the resistance of the retractor springs pressing the clutch elements against each other by means of levers or of an additional pressure plate. The engagement of the elutch for this reason needs no pedal and also its disconnection can be effected only by reducing the rotative speed. This is disadvantageous in so far, as the flux of force cannot be interrupted at any desired moment, as it is necessary on a sudden danger or when rapidly changing down from a higher transmission stage to a lower one.

For this reason, centrifugal clutches permitting the disconnection independently of the actual rotative speed by the conventional clutch pedal have been developed.

One of these known centrifugal clutches shows e. g. a pressure plate held in disconnected position by springs retraeting it to the cover plate of the clutch housing. Levers are pivotally mounted on the cover plate, one arm of which is attacked by the centrifugal weights and the other by the thrust bearing. At a predetermined rotative speed the pressure plate is pressed via a cam and short guided bolts contrary to the action of its springs against the clutch discs which are pressed against the housing.

With this centrifugal type elutch the coupling pressure produced by the centrifugal weights is increasing with an augmenting engine speed, so that the disengagement with high rotative speeds requires mueh force and fatigues the driver.

It has been proposed therefore to arrange the centrifugal weights at the circumference of the clutch housing and to provide them internally with helical springs the free ends of which are acting through rocking levers on the pressure plate. When the clutch is engaged the weights bear against the rims of the housing so that only the spring pressure is acting on the pressure plate but not the centrifugal weights. For disengaging a elutch of this type with the centrifugal weights engaged it will be only necessary to overcome the spring pressure, the centrifugal weights themselves do not change their positions.

Clutches of the type described above take much room, of which especially in the case of automotive vehicles cannot be disposed, so that they could not brought into use.

According to the present invention an essential simplification is obtained and little room is taken up with such a type of clutch by providing that the centrifugal weights interiorly equipped with springs, are pivotally mounted on the cover plate of the clutch housing and acting through openings in the cover plate on the pressure plate, the swinging movement of the centrifugal weights being limited by bent up rim of the opening in the cover plate. The pressure plate is in this case provided with recesses for the reception of the bolt heads.

The new centrifugal force device can be easily fitted also in a conventional frictional clutch equipped with the usual disengaging gear.

One form of embodiment of the invention is the accompanying drawing, in which

Fig. 1 is a section through the new centrifugal clutch in engaged position;

Fig. 2 shows the position of the centrifugal weights at low speeds, the clutch being disconnected.

The engine crankshaft **1** is rigidly connected to the clutch housing **2** forming the flywheel in which as in the usual manner the clutch disc **3** with the facing material **4** and the pressure plate **5** are fitted. The clutch disc **3** with its hub **6** is mounted for longitudinal movement but connected for rotation on the splines **7** of the shaft **8**. The clutch housing **2** is closed by the cover plate **9**, on which the supports **10** carrying the clutch levers **11** are mounted, which with one arm **12** attack the connection links **13**, whereas their other arms **14** are bearing against the thrust bearing **15**. The centrifugal weights **17**, in which the pressure bolts **19** under the influence of the springs **18** are slidably fitted, are pivotally attached to the lugs **16** of the cover plate **9**, said bolts being provided at one end with a stop ring **20** and at the other with a mushroom type head **21** reaching through openings in the cover plate and bearing in corresponding recesses **22** against the pressure plate **5**. The swinging movement of the centrifugal weights **17** is limited by abutments **23** on the cover plate **9**. Small springs **24** are withdrawing the centrifugal weights at low rotative speeds until they are contacting against the lip **25** on the cover plate **9**.

The mode of operation of the new centrifugal clutch is as follows:

If a predetermined engine speed is obtained, the centrifugal weights **17** are swinging out-

wardly, contrary to the action of the springs 24, compresssing the spring 18 and pressing the bolts 19 with their mushroom type heads 21 against the pressure plate 5 which is bearing via the clutch disc 3 against the housing 2, so that the clutch is engaged. As in case of a further increase in the speed of rotation the centrifugal weights 17 bear against the stops 23, there is no further increase in the coupling pressure. The disconnection of the clutch can be effected at any rotative speed by depressing the clutch pedal, thus moving the thrust bearing 15 to the left which causes the clutch lever to retract the pressure plate 5 from the clutch disc 3 contrary to the action of the springs 18 in the interior of the centrifugal weights 17.

FRITZ FIEDLER.

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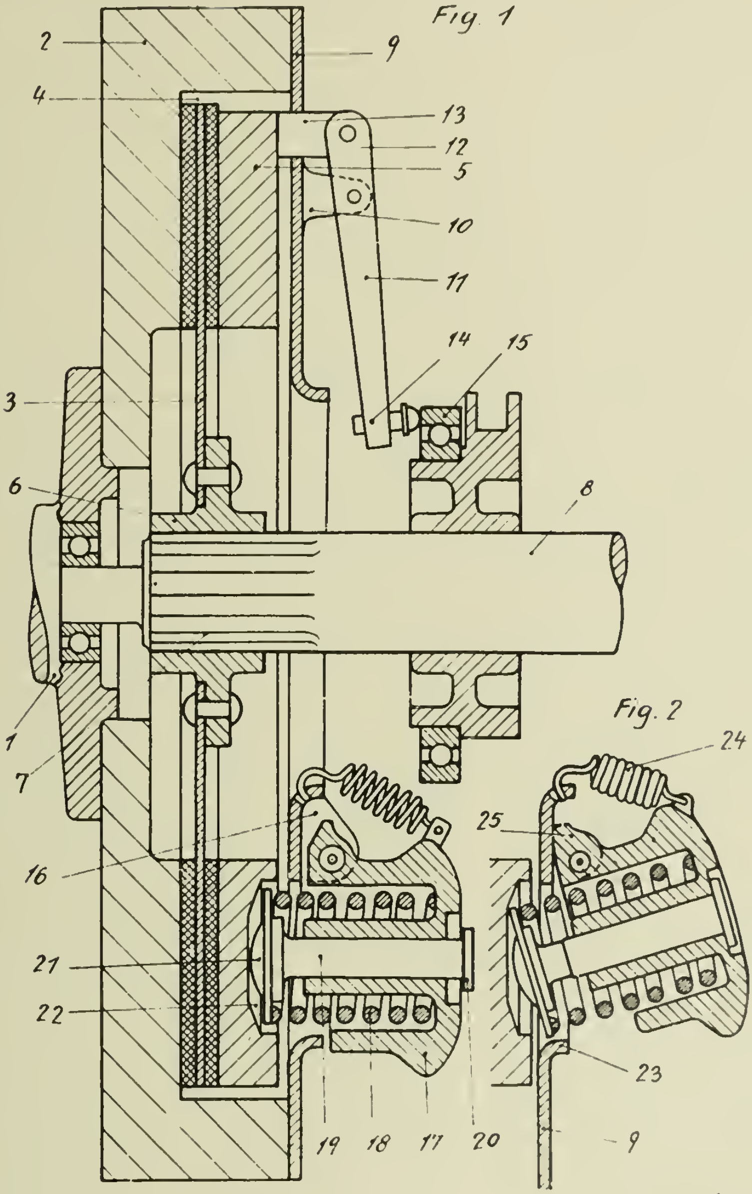

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Attorneys

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ALIEN PROPERTY CUSTODIAN

ELECTRIC CURRENT REGULATOR WITH PRESSURE LOADED CARBON-PILE COLUMN

Wolfgang Kehse, Berlin-Karlshorst, Germany; vested in the Alien Property Custodian

Application filed February 12, 1941

This invention concerns a regulating arrangement for electric current circuits, which retains the potential up to a determined current limit, and upon an increase regulates a lower potential, that is to say with a broken characteristic.

A characteristic of this kind is shown in Fig. 1, and portrays the potential dependent upon current. A is the characteristic parallel to abscissa for a constant potential, and the curve D shows a practically constant potential within the permitted loading limit, when it drops suddenly effecting a strong influence.

For this purpose the magnets which control the carbon column have a second winding, namely a current-winding connected in parallel with a constantly adjustable resistance, e. g. a carbon-pile column controlled by a hot-wire through which the consumed current flows. A supplementary coil of this type can be combined with the voltage coil normally provided.

In certain instances arrangements of this type have to control considerably high currents, therefore the use of a hot-wire sometimes presents difficulties, and for this reason it is proposed according to invention to utilize a bimetal arrangement, whose loose end after traversing a free path presses on the carbon column through a ratio appliance which equalizes the form variation between bimetal and carbon column, e. g. a lever. These bimetal arrangements are to be had today in a very perfected stage, and permit a very simple constructional form of voltage regulator for currents up to practically any desired limit.

In Fig. 2 a principal application example is given, and shows frame R with carbon column K fixed at the top, next to it the bimetal element B fitted by means of mounting block G, to the right-hand side spring F which exercises the necessary pressure on the carbon column, and at the bottom the bearing for ratio appliance H. The free end of bimetal element B has an adjusting screw S; and when out of operation, that is to say when cold and no current is passing there is a gap between said screw S and the left-hand arm of lever H, which may be increased or decreased by this screw S. In diagram 2 the position of bimetal element B during calefaction is shown lineated, further, during this initial process no influence is effected upon the carbon column since screw S must first traverse the free path to lever H. When the highest permissible current limit is reached screw S contacts with the lever, any further warming due to a rise in current causes bimetal element B to press the left-hand arm of lever H exercising a pressure effect contrary to the spring, consequently the pressure on carbon column K is decreased and a higher resistance is put into operation. This transformed resistance, as shown in the principal patent, has as a result, that the voltage regulator regulates a lower potential. It follows that the described arrangement has the same broken current-voltage characteristic as the well known arrangements.

WOLFGANG KEHSE.

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BY A. P. C.

W. KEHSE

ELECTRIC CURRENT REGULATOR WITH PRESSURE LOADED CARBON-PILE COLUMN

Filed Feb. 12, 1941

Serial No. 378,542

Fig. 1

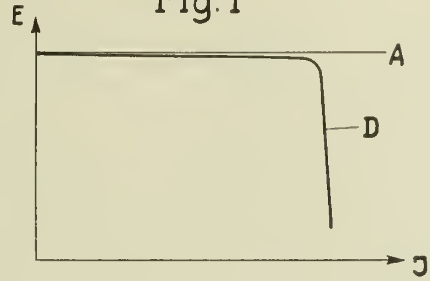
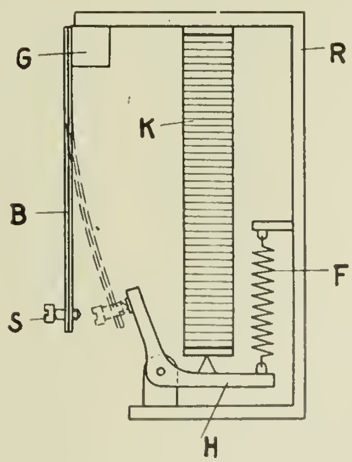


Fig. 2



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ATTORNEYS

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ALIEN PROPERTY CUSTODIAN

TELEPHONE RECEIVERS

Curt Peters, Hamburg, Germany; vested in the Alien Property Custodian

Application filed February 12, 1941

The present invention relates to telephone receivers and more particularly refers to a telephone receiver adapted to be held between car and shoulder.

It has been found that when using the telephone during the duration of the call the receiver must be held with one hand. With such a manipulation of the telephone it is rather difficult to make notices and writing down of the contents of the call is nearly impossible, because the paper or the writing block is permanently shifted to and fro by the movement of the hand effecting the writing as well as by the movement of the pencil or the pen. The blotting-pad, however, cannot be held by the other hand as the latter is required for holding the telephone receiver.

It has already been tried to remove this drawback. So for instance it is known to arrange a rubber ring about the lower end of the simple receiver funnel now out of use. Besides the fact, that this method may be used in connection with receiver funnels out of use only this known device has the further drawback that the receiver funnel may be clamped to the upper shoulder by a pressure of the head only, so that sliding down of the telephone receiver is by no means positively prevented.

Furthermore, holding devices for micro-telephones have already become known according to which the receiver is fixed to a frame which is carried by the neck and bears against the shoulder. These devices, of course, hold the receiver in the proper position but are too inconvenient and complicated.

The drawbacks of the known arrangements are avoided according to the present invention by forming as a bead (counter-bearing at the shoulder) the upper end of the handle of the micro-telephone (in the level of the lower edge of the ear cap or earpiece) at the side adapted to rest on the shoulder.

In the accompanying drawings two embodiments of the invention are shown by way of example.

In these drawings:

Figs. 1 and 2 show a telephone receiver constructed according to the invention in rear elevation and side elevation respectively, and

Figs. 3 and 4 illustrate similar views of a known telephone receiver modified in accordance with the invention.

As may be seen from Figs. 1 and 2, the handle, compared with the handle of the otherwise used micro-telephones preferably is somewhat flattened and formed with a bead like portion A. Moreover, the bead-like portion A as well as the side portion B of the micro-telephone, adapted to rest upon the shoulder, are roughened.

A telephone receiver constructed as described above positively prevents sliding off of the receiver from the shoulder and allows the use of both hands for writing down notices during calling.

Besides the above mentioned novel form of receiver, the hitherto used micro-telephone also may be so constructed that sliding off of the shoulder is positively prevented and both hands of the person calling are free for other purposes. This may be obtained, as shown in Figs. 3 and 4, by providing the handle of the micro-telephone with a coat or shell D the upper end of which (about in the level of the lower edge of the ear cap) at the side adapted to rest on the shoulder during use is provided with a bead-like portion C (forming a counter-bearing at the shoulder).

Preferably this coat or shell is made of rubber. leather or any other material having a rough surface or adherent properties. Moreover, the bead-like portion as well as the side of the coat or shell adapted to rest on the shoulder are roughened.

The coat or shell D according to Figs. 3 and 4 may be fixed to the micro-telephone in any desired manner by cords or straps, buttons or the like. During use, the micro-telephone is simply put on the shoulder. The bead-like portion C as well as the roughening of the handle prevent sliding off of the receiver.

The advantage of the arrangement according to the invention consists in ensuring in a simple manner an unconstrained or a non-positive, but nevertheless safe seat of the micro-telephone during calling.

When using the micro-telephone the latter is simply put on the shoulder. The bead-like portion as well as the roughened surface of the handle or of the coat or shell prevent sliding off of the receiver.

CURT PETERS.

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BY A. P. C.

C. PETERS
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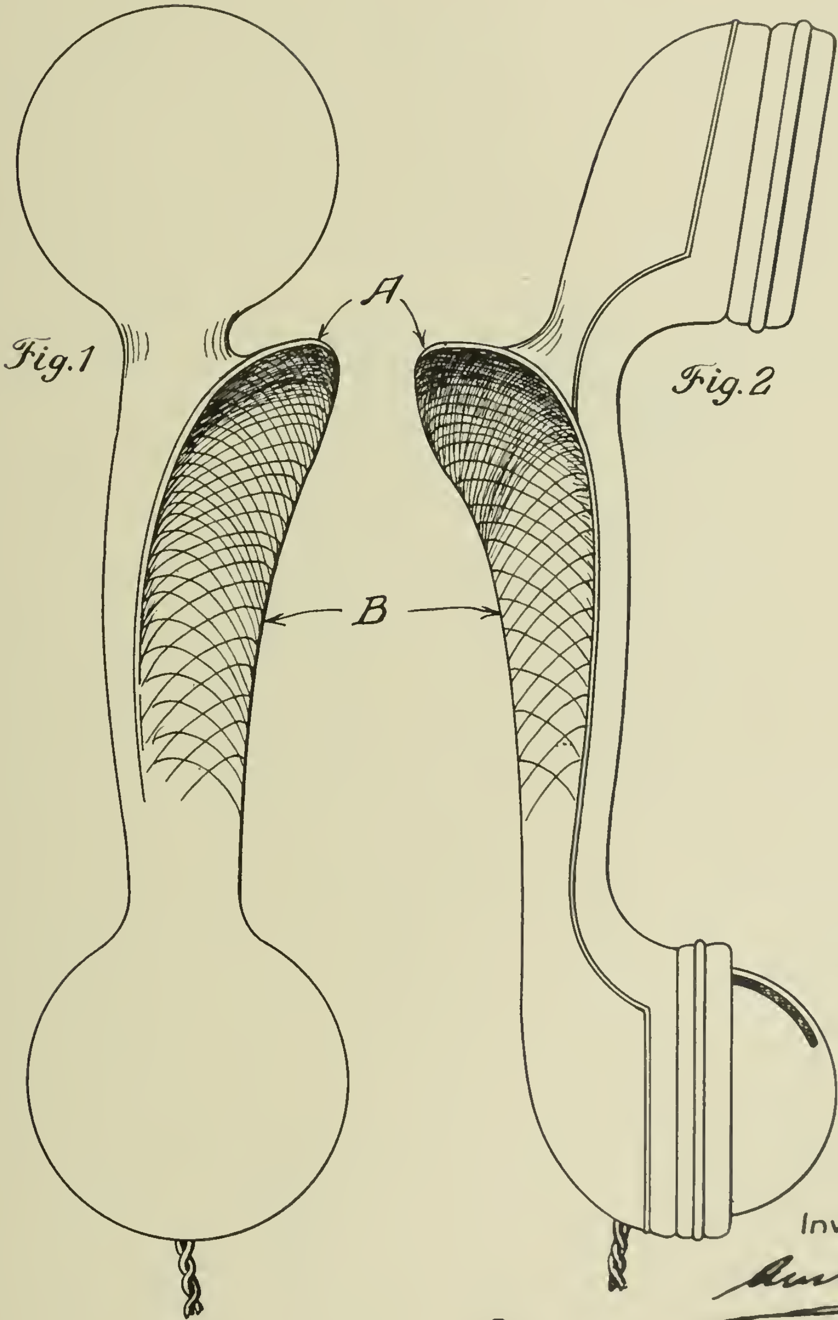

Inventor

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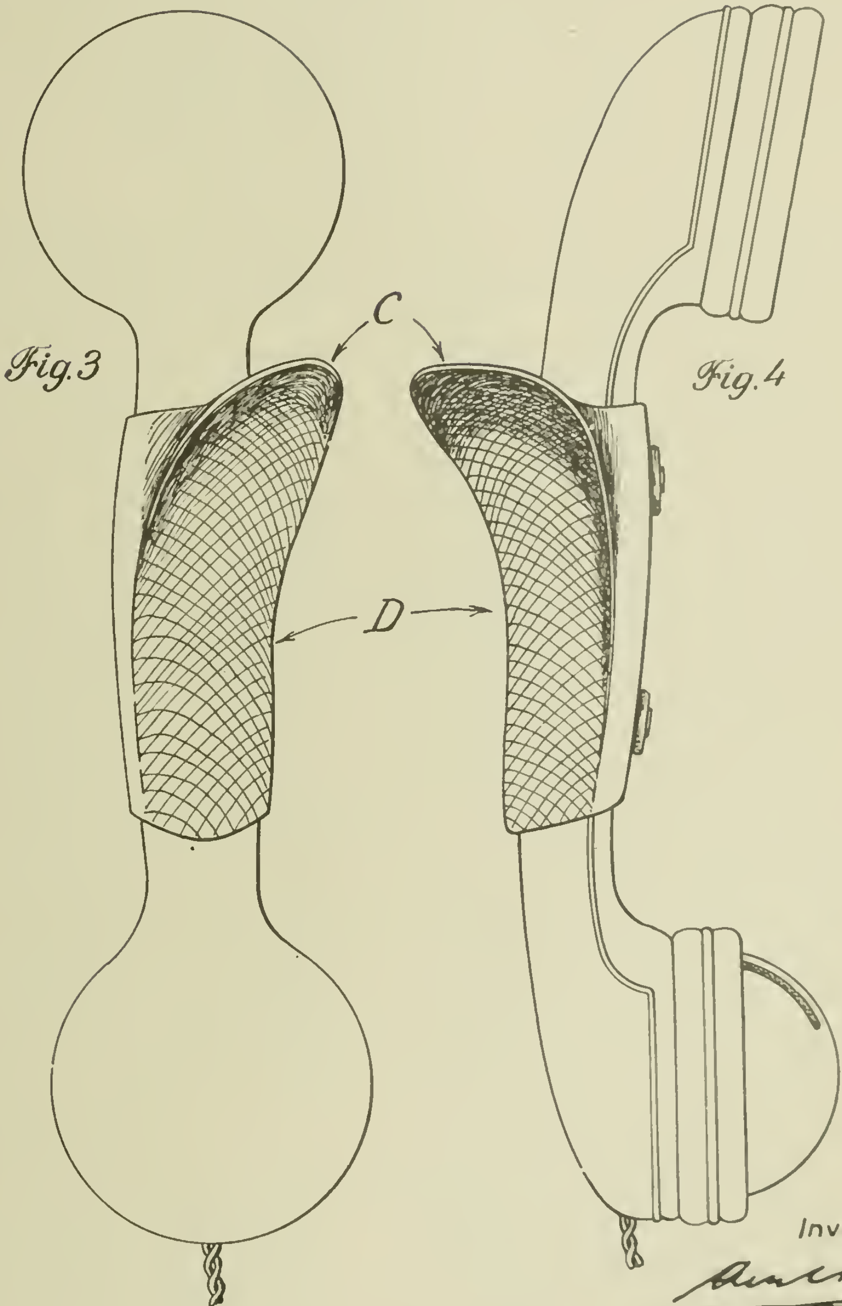

Inventor

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Attorney

Published May 18, 1943 Serial No. 378,719½

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR THE MECHANICAL LOADING OF BEETROOTS ON THE FIELD INTO THE DRAY

Georg Kittler, Opperau, near Breslau, Germany; vested in the Alien Property Custodian

Application filed February 13, 1941

This invention relates to an apparatus for the mechanical loading of beetroots taken out of the earth, heaped on the field in separate heaps, said heaps being placed the one behind the other in long rows.

The loading device comprises a frame, on which guide rollers for the conveying band are mounted and which carries a conveyor trough, the lower part of this frame being bent out of the direction of the conveyor trough, and the conveying band of the frame rests during the operation on the top of the heap of beetroots. In these known apparatus the frame parts which carry the conveying band and the conveyor trough are mutually secured in position during the operation, so that this loading apparatus can be advantageously employed for heapable material, that is for conveying sand, gravel, cereals and the like, but not for loading of heaps of beetroots, that is of conical heaps the diameter of which is about 1.2 m at the bottom and the height of which is about 80 ca.

The characteristic feature of the present invention consists in that the frame, which carries the conveying band and the conveyor trough is during the loading freely oscillatable about a shaft at its upper end, so that the conveying band resting on the heap of beetroots moves downward on this heap in accordance with the decreasing height of the heap of beetroots.

Two embodiments of the invention are illustrated by way of example in the accompanying drawing, in which the first embodiment is illustrated in Figs. 1 to 5 and the second embodiment in Figs. 6 and 7.

Fig. 1 shows the loading device in side elevation partly in section,

Fig. 2 is a top plan view of Fig. 1,

Fig. 3 is a front view of Fig. 1,

Fig. 4 illustrates a detail in section on line $x—x$ of Fig. 5,

Fig. 5 illustrates this detail in top plan view,

Fig. 6 shows the second embodiment of the invention in longitudinal section on line $y—y$ of Fig. 7,

Fig. 7 is a cross-section on line $z—z$ of Fig. 6.

The vehicle frame **1** is of such shape that, when moved in the direction of the line in which the heaps of beetroots lie, it runs by means of its wheels **2** and **3** on either side of the heaps so that these heaps of beetroots lie always freely between the wheels on this frame on which a motor **4** is fixed. In the upper ends of arms **5** of the frame a shaft **6** is journalled, which carries sprocket wheels **7** and is driven by a sprocket wheel **8** by means of a sprocket wheel **9** keyed on the driving shaft of motor **4** and adapted to be selectively engaged with or disengaged from the driving shaft.

Bars **11** are oscillatably mounted on shaft **6** and a shaft **12** with sprocket wheels **13** is journalled in the lower ends of these bars, arms **14** being oscillatably mounted on shaft **12**, the free ends of said arms carrying a shaft **15** on which two sprocket wheels **16** are keyed. Chains **17** on the sprocket wheels **7**, **13**, **16** are circulated when the sprocket wheels **8** are driven. These chains **17** are connected the one with the other by transverse rods **18** carrying prongs **19**. In the arms **20** of bars **11** a shaft **21** is journalled, which carries guide rollers **22** for the chains **17**. At **25** ropes **24** are attached to the bars **11** and conducted over rollers **23** to drums **26** keyed on a shaft **27**, said shaft being driven from a sprocket wheel **29** of the motor shaft by means of a sprocket wheel **28** and a chain **30**. This drive can be engaged or disengaged by a clutch **31**.

On the shaft **12**, which forms the articulated connection between the frame arms **11** and the arms **14**, a worm **45** is rigidly arranged as shown in Figs. 4 and 5, and a plate **44** is fixed between the arms **14**, a wheel **46** cooperating with a worm **45** being revolubly mounted on this plate. A wheel **47** meshes with wheel **46** and is also rotatable on the plate **44**. This wheel **47** has a pin **48** engaging in a guide slit **50** of a bar **49**, which is guided in longitudinal direction in recesses of the bars **14**. This bar **49** carries at its ends rakes **51** having prongs **52**. When the shaft **12** revolves the toothed wheels **46** and **47** are also rotated by the worm **45**, whereby the rakes **51**, through the intermediary of the bolt **48** and the guide slit **50**, are moved to and fro with bar **49**. The prongs **52** or the rakes **51** may be movably arranged so that the prongs can fold over when moved in outward direction, in case they should encounter resistance. A conveyor trough **35** is oscillatably suspended by means of bolts **39** in the arms **38** of bars **11**. The bottom of this conveyor trough is formed by laths **36** extending in the longitudinal direction of the trough. The upper part of trough **35** is connected by springs **37** with the bars **11**. The conveyor trough **35** has further at its upper end projections **40**, cooperating with ratchet wheels **41** fixed on shaft **6**, at the rotation of which wheels a shaking movement is conveyed to the conveyor trough.

The apparatus is moved by means of the wheels **3** driven from the motor **4** and steered by the wheels **2** in a suitable manner.

The operation at the loading of the beetroots is as follows:

The bars 11 with the conveyor trough 35 and the arms 40 are lifted by means of the rope drum 26 and the ropes 24, so that the conveying device can run without hindrance over the heaps of beetroots without touching the same. The apparatus is run over the heap to be loaded so that this heap, designated by "A" in Fig. 1, between the wheels 2 and 3 of the frame lies correctly under the conveying band. The conveying band is then lowered with the conveyor trough by letting go of the ropes 24 until the arms 14 of the bars 11 approximately assume the position indicated in Fig. 1 by thick dash lines. The prongs of the conveying chains which are in the range of the arms 14 rest then on the heap "A" of beetroots. If the conveying device is started, the conveying band transports the beetroots from the heap to the conveyor trough 35 and in this conveyor trough to the top.

The dray to be loaded with beetroots has been brought so close to the apparatus, that the upper end of the conveyor trough is lying approximately over the middle of the dray so that the conveyed beetroots can be then correctly loaded into the dray.

After the conveying device has been started, the bars 11 are lowered by gradual letting go of the ropes 24, which can be carried out automatically, so that the beetroots from the heap are gradually removed from above downwards. The irregularities, which might occur between the uniform lowering of the bars 11 and the not always uniform removing of the beetroots from the heap "A", are equalized thereby that the arms 14 with their conveying band rest on the heap of beetroots so that they can freely move upwards and downwards.

At the starting of the conveying device the ratchet wheels 41 have also been rotated, which cooperate with the projections 40 of the conveyor trough 35, so that during the conveying a shaking movement is communicated to the conveyor trough, so that the beetroots moved along the trough are freed from adhering dirt.

The conveying chains 17 rotate the sprocket wheels 13 and with these the shaft 12 and the worm 45. Through the intermediary of the wheels 46 and 47, the guide slit 50 and the bolt 48 the bar 49 is thus moved to and fro and, during the whole time of the conveying, also the rakes 51 operate, and in such a manner that they bring back again to the conveying band the beetroots which roll off to the sides. This apparatus can also be constructed so that each rake 51 has its own drive, so that the two rakes operate the one against the other.

If the elements of the conveying device have arrived in the position shown in Fig. 1, all beetroots of the heap have been loaded in the dray. By the winding drums 26 and the ropes 24, the bars 11 with the conveyor trough 35 and the arms 14 are lifted again, and the conveying device can then be run to the next following heap of beetroots.

The movement of the arms 14 relative to the bars 11 in downward direction is preferably limited by any suitable means, so that the arms 14 cannot oscillate in downward direction relative to the bars 11 beyond the position indicated in Fig. 1 in full lines. An automatic switching might also be provided, by which the raising of the bars 11 with the arms 14 and the conveyor trough is effected as soon as these elements have arrived in their lowest position, that is the beetroots from the heap have all been loaded.

In this embodiment of the invention the conveying device operates on its whole length perpendicularly to the longitudinal direction of the rows of heaps of beetroots.

In the second embodiment of the invention shown in Figs. 6 and 7 the conveying device is subdivided and the lower part of the same operates in the longitudinal direction of the rows of heaps of beetroots and conveys the beetroots to the upper part, which then operates again, as in the embodiment first described, perpendicularly to the row of heaps of beetroots in order to load the beetroots into the dray.

In this form of construction a bracket 61 is mounted on the vehicle frame 60 and a shaft 62 is journalled in this bracket and driven from a motor 63 by a chain 64 and a sprocket wheel 65. The vehicle frame, composed of the elements 66, 67 and 68, is freely oscillatably mounted on shaft 62 and carries the shafts 69, 70 with the sprocket wheels 71, 72 over which the conveying chains 74 are conducted, which run over sprocket wheels 73 keyed on the driving shaft 62. Also in this instance the chains 74 are connected the one with the other by transverse bars which carry prongs 75, the chains circulating in the direction of the arrow 76 when shaft 62 revolves. A conveyor trough 77 is suspended in the frame part 68. The frame elements 66, 67, 68 hang on a bow 78 to which a rope 79 is attached which is conducted by a roller 80 to a winding drum 81 rotated by the motor 63, so that the vehicle frame can be lifted and lowered.

Two boards 83 destined to engage on either side of the heap "A" of beetroots are oscillatable about the shaft 62. Each board 83 carries a bar 84 having a slit 85 through which engages a bolt 86 of the vehicle frame.

This part of the conveying device conveys the beetroots into a basket 78, from which extends the other part of the conveying device operating perpendicularly to the first part, said second part conveying the beetroots from the basket 78 into the dray. A shaft 92 is journalled under the basket 78 and carries sprocket wheels 93 over which conveying chains 94 are conducted. The shaft 92 is driven from shaft 62 through the intermediary of a chain 94, a sprocket wheel 95 and bevel wheels 96, 97 and thereby moves the conveying chains 94 in the direction of the arrow shown in Fig. 7. The conveyor trough 88 is, as in the first form of construction, made of laths, but prongs 91 moved by the conveying chains engage in this instance from below between the laths, and grip the beetroots from the basket 78 and convey them on the conveyor trough 88 in upward direction, until they drop at 98 into the dray.

The operation is in this instance as follows:

With the aid of the winder 81 the rope 79 is first wound up. The bolt 86 strikes then against the upper end of the slit in the bar 84 and lifts this bar and with it the corresponding side boards 83 such a distance that the boards are lifted off the ground and the conveying device can be run without hindrance to the heap A to be loaded. The apparatus is then adjusted so that it assumes the position shown in Figs. 6 and 7 relative to the heap of beetroots A. The rope 79 is then let go again. The frame with the boards 83 descends until the boards, as shown in Figs. 6 and 7, rest on the ground at either side of the heap of beetroots. When the frame is further

lowered the part of the conveying band 74 operating in the range of the frame part 67 comes to rest upon the heap of beetroots, and if then by the motor 63 the shaft 62 is revolved, the beetroots are conveyed from the heap A first into the conveyor trough 77 and on this trough in the direction of the arrow 76 into the basket 78. At the same time the sprocket wheel 95 is rotated from shaft 62 through the intermediary of the sprocket wheels 97, 96 and the shaft 92 revolved by the chain 94, so that by the conveying band 94 and the prongs 91 the beetroots are conveyed from the basket 78 on the conveyor trough 88 into the dray. Also in this instance the conveyor trough 88 is preferably equipped with the shaking device such as described with reference to the first form of construction.

The frame 66, 67, 68 descends in accordance with the decreasing height of the heap of beetroots A, so that the element 67 in the lowermost position of the frame is parallel to the ground whereupon the prongs 75 operating in its range slide along the ground and thus convey all beetroots from the heap into the conveyor trough 77 and further to the dray.

This loading of the beetroots into the dray takes place extraordinarily quickly by means of the apparatus shown in Figs. 1 to 5 as by means of the apparatus shown in the Figs. 6 and 7, so that consequently considerably more time is saved and also saving in wages is obtained. As further the beetroots when travelling in the conveyor trough are freed from adhering dirt, the efficiency of the car from the field to the railway station is considerably greater than up to the present and the deduction made by sugar factories for the material supplied is considerably less, so that with the new conveying apparatus an extraordinarily economical progress is obtained.

The conveying apparatus according to this invention can also be employed advantageously for loading into the dray potatoes from the stocks.

GEORG KITTLER.

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3 Sheets-Sheet 1

Fig. 1.

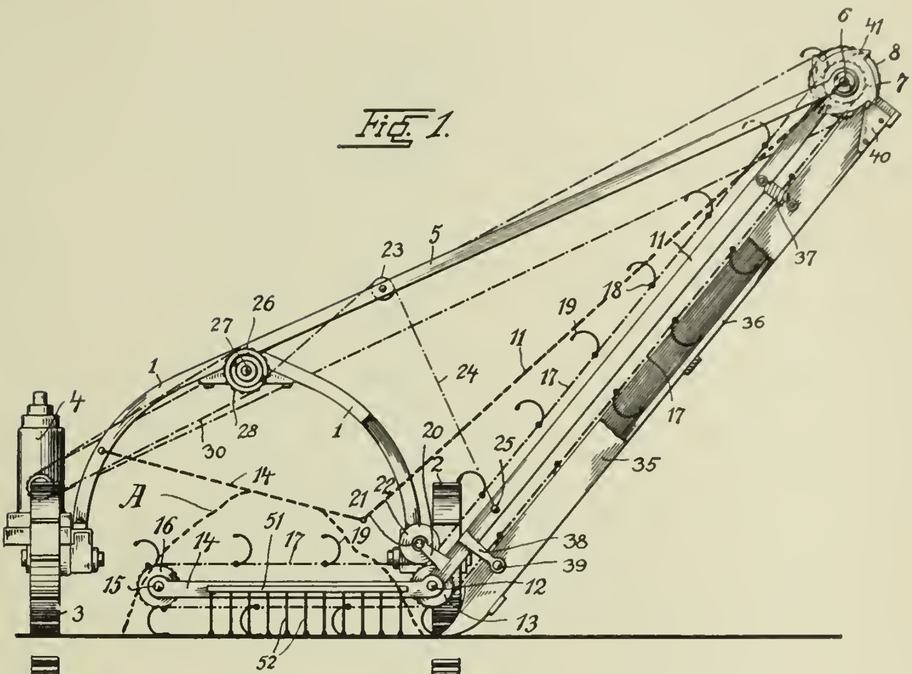
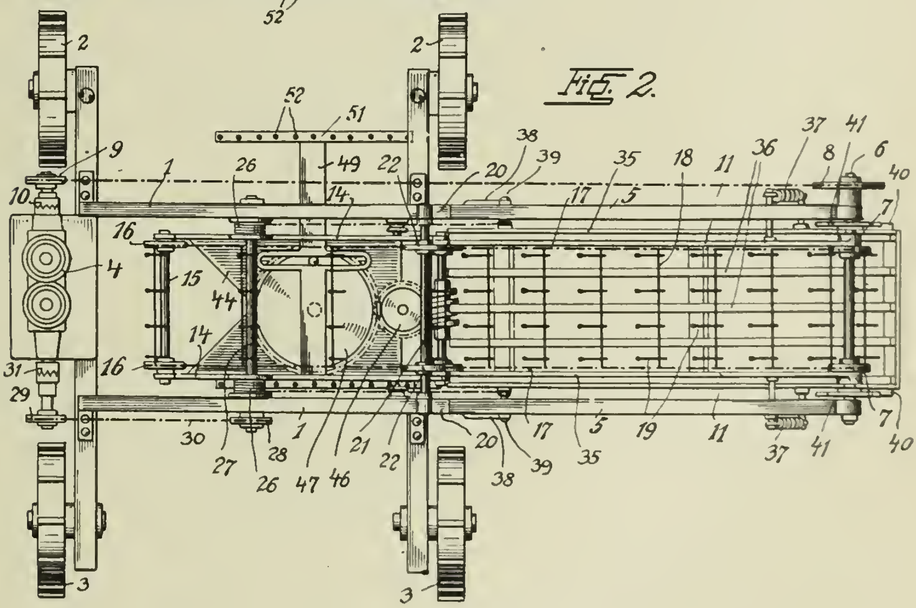


Fig. 2.



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3 Sheets-Sheet 2

Fig. 3.

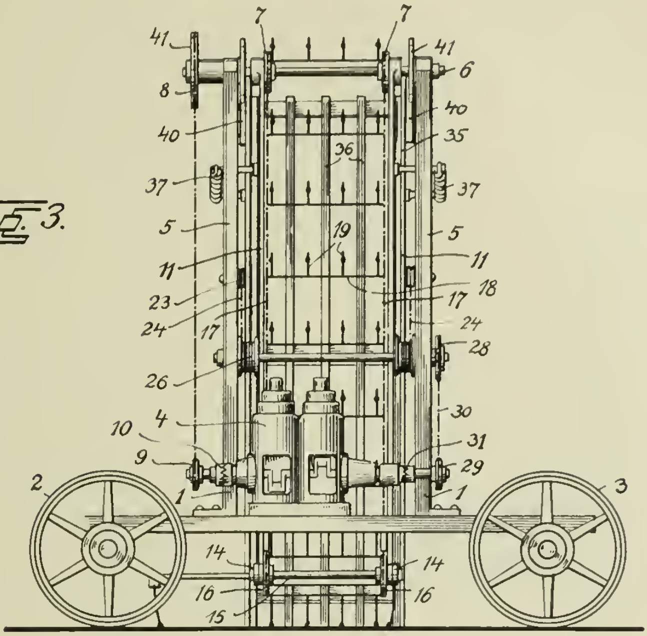


Fig. 4.

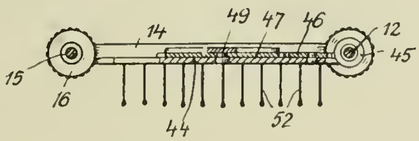
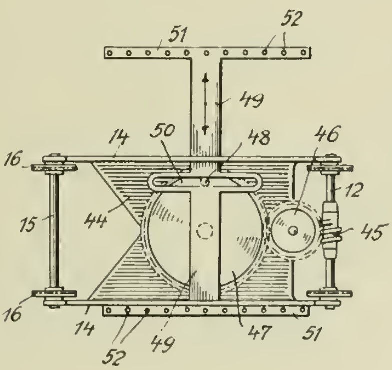


Fig. 5.



Inventor

Georg Kittler

by [illegible] his attorney

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3 Sheets-Sheet 3

Fig. 6.

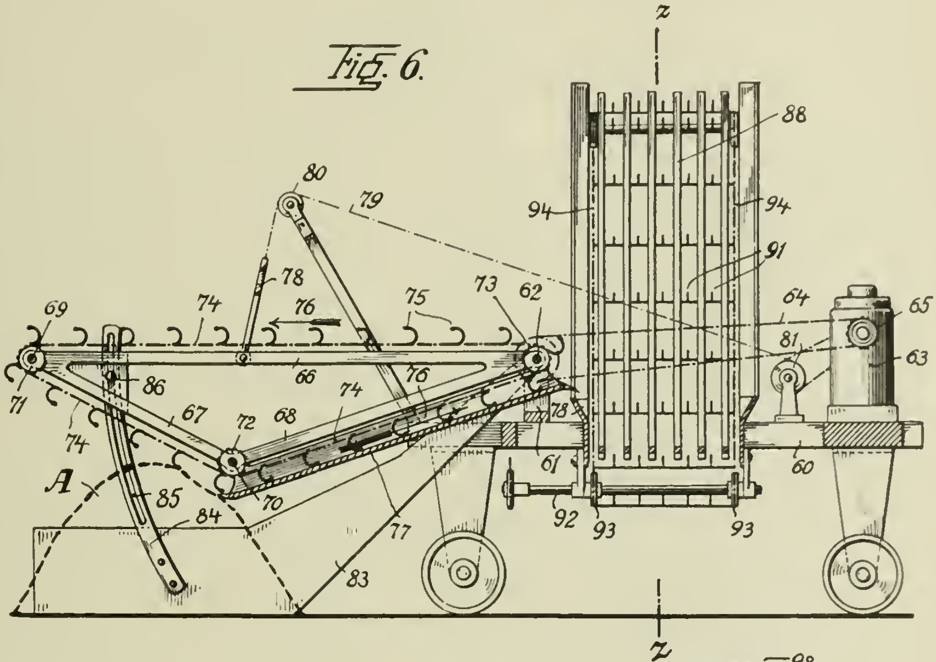
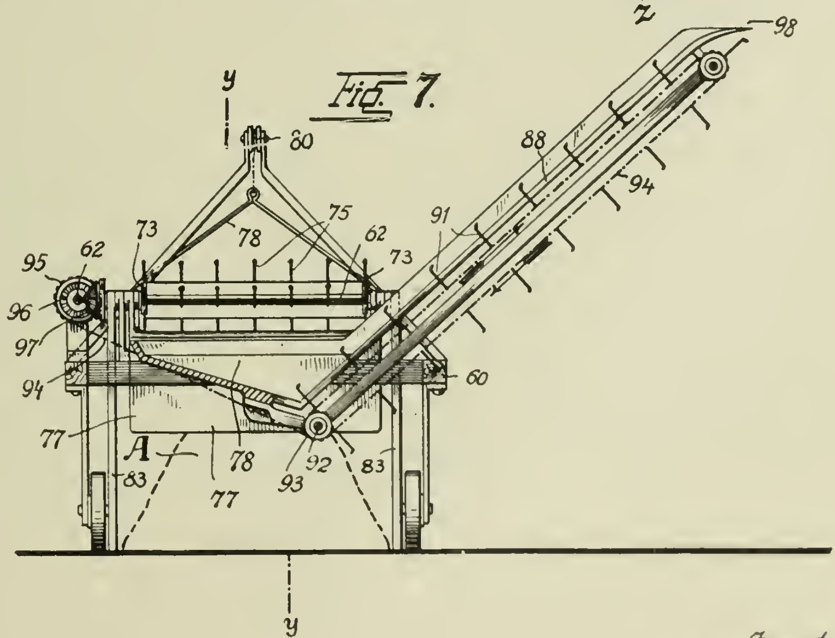


Fig. 7.



Inventor
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ALIEN PROPERTY CUSTODIAN

MICROPHONES

Max Pöhls, Berlin, Germany; vested in the Alien Property Custodian

Application filed February 14, 1941

This invention relates to a novel and useful microphone mount comprising a ring-shaped element composed of two concentric rings connected with an elastic material in a practically non-dissoluble manner.

Microphones are often employed in application fields in which the speaking person is to walk to and fro in front of a microphone. In such cases, the danger exists that the sound of the stepping passes across the stand and the casing to the microphone thereby subjecting it to disturbance oscillations.

In order to avoid these drawbacks, the microphone is placed on a stand using thereby an intermediate part having a possibly small size and permitting a central mounting of the microphone. Owing to the small radius of the mounting place, the danger of an appearance of disturbance oscillations is reduced.

In the hitherto known forms of construction of such stand microphones, the required damping material undergoes a greater or lesser compression at the screwing together with the mounting elements. The damping material hence loses its character as a damping material. The sound transmission of the steps is thus favored.

In recent times a new work material has gained great importance and this material is produced in that a soft rubber body is vulcanized between metal plates. The soft rubber becomes thereby united with the metal in a practically unseparable manner. The connection has strength values which lie above the strength of the rubber material. This new work material is employed especially for the mounting of larger machine parts in order to provide an insulated connection with the understructure. The new work material is hereby given the task of assuring an oscillation-free mounting of power machines and work machines. It is utilized also for producing elastic couplings, rubber torsion springs, joints, etc.

In accordance with the novel feature the drawback inherent to the hitherto known microphone mountings is avoided by the use of the above-mentioned new work material with appropriate adaptation of the suspension whereby for the mounting of the microphone on the stand, a ring-shaped element is utilized which is composed of an elastic work material connected in a practically non-dissoluble manner with an inner metal ring and outer metal ring. In accordance with the above explanations, the elastic intermediate layer consists preferably of a soft rubber body which is vulcanized between the said metal rings. The inner ring of metal is threaded and also the metal ring encompassing the elastic ring is provided with a thread. The inner ring has screwed thereinto the short stand which supports the microphone, while the outer ring is screwed into a sleeve which is supported in turn by the actual microphone pedestal.

The accompanying figure shows an example of construction according to the novel feature. The microphone M is screwed into the structure element E which serves for absorbing the sound of the steps. This element E comprises an inner metal ring R_1, the ring D of elastic work material such as soft rubber for instance and which is connected with the former ring in a practically undissoluble manner, and the outer ring R_2 likewise connected with the elastic work material in a practically undissoluble manner. The ring R_1 has inner threading so that the stand *St* of the microphone M can be screwed into said ring. The ring R_2 has outer threading and can thus be screwed into a sleeve H which is supported from the actual pedestal *Sta*. Eventually, the outer threading of the ring R_2 can be dispensed with and the element which insulates against the sound of the steps can be fastened in the sleeve H by way of pressing.

MAX PÖHLS.

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M. PÖHLS
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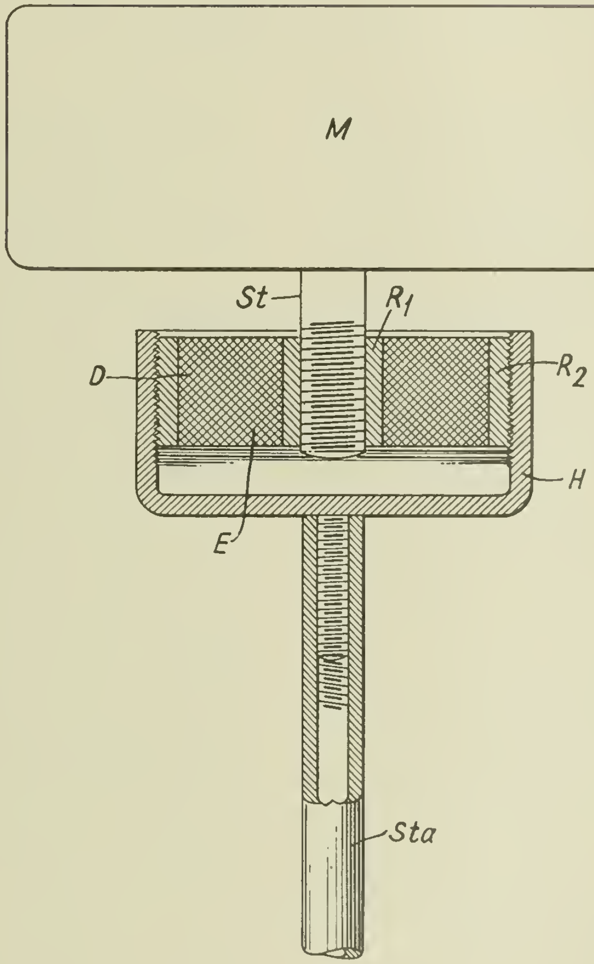

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ALIEN PROPERTY CUSTODIAN

METHODS OF PRODUCING SOUND RECORDS ON FILMS

Rolf Görisch, Dresden, Germany; vested in the Alien Property Custodian

Application filed February 15, 1941

The invention relates to improvements in a method of producing sound records on film and particularly is directed to variable density sound records whose track is not of uniform width, but is varied in width during the recording.

In a sound record production in which the intensity of recording illumination is controlled solely in proportionate ratio to the sound waves to be recorded, there is produced a record with a characteristic which is not entirely satisfactory. The characteristic referred to is the one which shows the relation between the exposure of the film during the recording and the light transparency of the film at its reproduction. The very fact that a relatively small portion only of this characteristic is presented by a straight line and that a proper control of the sound reproduction is limited to this straight line portion of the characteristic has not only a restricting effect upon the volume of the reproduced sound, but also has a restricting effect upon the factors of tolerance admissible during the processing of the film. In spite of the fact that the variable density type of recording has a number of advantages in the art of sound recording, the tendency is to revert again more and more to variable area recording, because only the latter type of sound record makes it possible to apply to the film a great range of transparency without distortion. The method of producing a variable density sound record has the further drawback that it is influenced to a considerable extent by variations in the intensity of the source of light, and also by irregularities during the processing of the sound film.

The suggestion has already been made to produce variable density sound records in which, for the purpose of attaining predetermined effects, the width of the recorded sound is varied. In this suggested method the recording elements are constructed and arranged in such manner that the width of the record decreases proportionately to the decrease in the transparency of the film. Hence, there was a simultaneous application or superimposition of sound variation due to the fact that the two ways of recording varied in the same direction. The greater densities are recorded at locations on the film where the sound record has its narrowest areas, and vice versa. The resulting characteristic of a film of this type has a substantially quadratic course. The disadvantages of such a characteristic is well known.

It is an object of the present invention to eliminate in a very advantageous way the disadvantages which up to now were inherent to variable density recording. According to the invention, there taken place in this type of variable density sound recording, which simultaneously employs a variation of the width of the sound record upon an increase in transparency of the film, a decrease in the width of the recording area.

Another object of the invention is to produce in addition to a normal variable density record a second record which is arranged parallel and in phase to the normal variable density record and in which the width of the area varies in inverse proportion to the transparency of the film. The reproduction of this double record, preferably, taken place by scanning devices which may be known in themselves, as for instance, from scanning push-pull sound records.

It is also an object of the invention to produce a sound record of the above named type in which the greatest variation in the width of the record does not exceed one-half of the entire width of the sound track.

Still another object of the invention is to produce a system of recording in which a satisfactory regulation may be effected even with transparencies which up to now had been considered too low for successful performance.

The invention is illustrated in the drawing which not only explains of few examples of the invention but which at the same time illustrates the advantages of the same over the prior state of the art.

Fig. 1 illustrates the characteristic of a conventional variable density sound record on a standard film with normal exposure and development.

Fig. 2 illustrates a combined variable density and variable area sound record of the prior art.

Fig. 2[a] illustrates diagramatically the essential parts of the sound recording device which produces the sound record of Fig. 2.

Fig. 3 illustrates the characteristic of the sound record of Fig. 2.

Fig. 4 illustrates diagrammatically the essential parts of the sound recording device employed in practicing the present invention.

Fig. 5 illustrates the characteristic of the sound record produced according to the present invention, and the

Figs. 6 and 7 illustrate diagrammatically modified embodiments of a sound recording device for practicing the present invention.

Referring to Fig. 1 which shows a characteristic curve 9 or a conventional variable density sound record on a standard film normally exposed and developed, the exposure during the re-

cording is indicated in the coordinate system along the abscissa and the transparency during the reproduction along the ordinate. It will be seen from this characteristic 9 that a relatively small portion thereof only is straight and that, as has been mentioned above, the range within which a proportionate control is feasible is too small for practical purposes.

Fig. 2 illustrates the sound track of a record of the prior art, wherein variable density, as indicated at 1, is combined with variable area, as shown at 2, while Fig. 2ª illustrates diagrammatically the essential parts of the recording device which enter into its recording method. The recording device substantially consists of a slit 3 which is photographed upon the film, and a diaphragm 4 which represents the triangularly shaped cut-out 5 for a gray wedge 6. This diaphragm 4 is actuated in accordance with the vibrations of the sound waves to be recorded and thereby produces a sound record of the type illustrated in Fig. 2. Fig. 3 shows the characteristic of this sound record. It is conspicuous by a very wide range of high transparencies for a narrow range of exposures.

As contrasted with the prior method, the present invention proposes a method in which the gradation of the gray wedge 6, illustrated in Fig. 2ª combined with the triangularly shaped cut-out 5 of the diaphragm 4, is arranged in the opposite direction, as shown in Fig. 4 wherein the gray wedge is designated with 6ª. Fig. 5 shows the characteristic 12 of a sound record prdouced by a control making use of the device diagrammatically illustrated in Fig. 4. Within the range in which the characteristic of the pure variable density record is a straight line, the characteristic of Fig. 5 also is a straight line. But this straight line is now parallel to the abscissa or exposure axis. This is due to the fact, that the control of the width of the record is effected inversely to the control of the transparency of the film, so that the light which during the scanning passes through the film, remains practically constant within the range indicated by the parallel straight portion of the characteristic of Fig. 5. In those portions, however, in which the characteristic of Fig. 1 shows curves, at 9ª and 9ᵇ, the characteristic 12 of Fig. 5 shows curves at 12ª and 12ᵇ, which are oppositely directed to those of Fig. 1. This indicates that with a controlling device as illustrated in Fig. 4, it is possible to compensate all those defects which are caused in a normal variable density recording by the curvatures of the characteristic.

Practically, the invention as outlined above, provides two substantially advantageous applications in the art of sound films.

The first employment may, for instance, be one in which a single control or regulating mechanism is used to produce a normal variable density record, and parallel and in phase therewith a sound record of the type of the present invention is produced. These two sound records, which appear on the film side by side are then reproduced according to the push-pull method. Fig. 6 illustrates diagrammatically a control device of this type, namely a diaphragm 14 having a rectangular cut-out 15 for the normal variable density record, and also having a triangular shaped cut-out 16 for the sound record of the present invention. The slit is designated with 17 and the gray wedge covering both cut-outs with 18.

This method has the advantage that, owing to the auxiliary record, the toe and shoulder curves of the characteristic 9 of Fig. 1 may be counteracted or compensated, thereby producing a sound record of variable density which not only may be regulated as to transparencies up to their maximum values, but also may be reproduced absolutely free of distortions. Thus, it would be possible to add to a normal variable density record, the present auxiliary record as a matter of precaution. If then the normal variable density record on the finished film is satisfactory, this normal variable density record will be the one which is employed exclusively for making the theatre films. If, however, the exposure of the film of its subsequent processing has been faulty, it is feasible to produce a second record by employing together with the normal record the auxiliary record and to compensate by means of this auxiliary record any distortions which had their origin in defective exposure or in irregularities during processing. It should also be mentioned that the present method makes it possible at these points of the record at which the regulation has been a feeble one only, to utilize a very low transparency because in this manner the curved parts 9ª and 9ᵇ of the characteristic 9 of Fig. 1, may be compensated. Therefore, the present method provides for a considerable increase in volume or intensity of sound.

The second employment of the invention consists in the combination of the same with a normal variable density sound record, whereby the scanning is accomplished in conventional manner and not by the push-pull method. Fig. 7 illustrates diagrammatically a control mechanism for this manner of practicing the invention, in which the diaphragm plate 20 has a single trapezoidal cut-out 21, movable relatively to the slot 22, and covering three wedges 23, 24 and 25 of which the center one is arranged with it denser portion opposite to the denser portion of the other wedges. It is true, that in this instance there is not produced a characteristic with a straight curve, but there is produced an absolutely symmetric characteristic which has advantages, inasmuch as with a symmetric characteristic, the distortions due to the curvature of the characteristics are far less obnoxious that in a sound record having an asymmetric characteristic.

It is of particular advantage to make use of a mirror oscillograph for the control of the light in the method of the present invention, and particularly in those two methods which have been described in the above. The mirror oscillograph would utilize the triangular diaphragm in combination with a gray wedge or with an edge which is reproduced in blurred condition on the slit and parallel to the same.

ROLF GÖRISCH.

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R. GÖRISCH
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379,081

Fig. 1

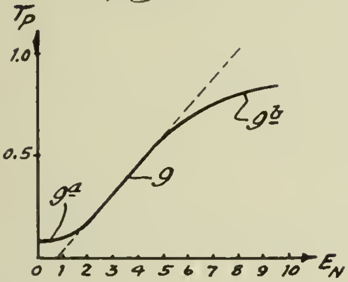

Fig. 2

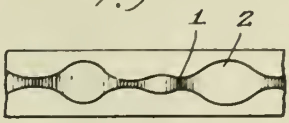

Fig. 2a

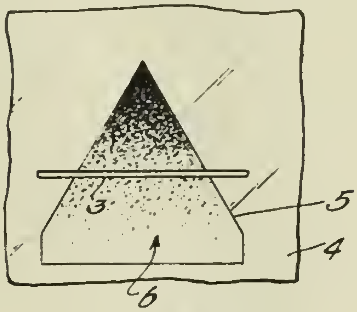

Fig. 3

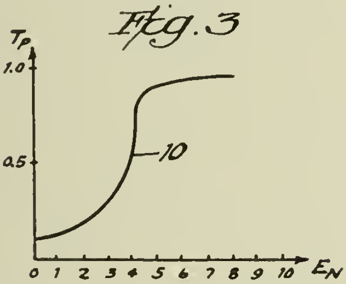

Fig. 6

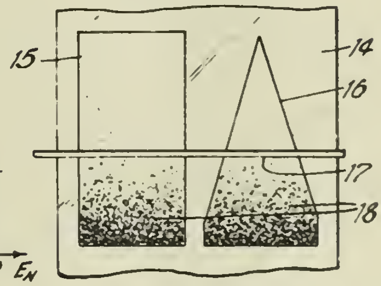

Fig. 4

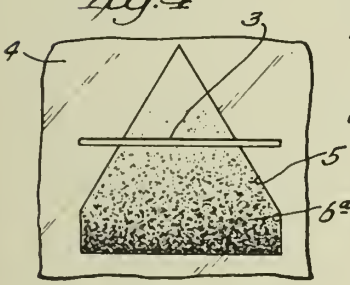

Fig. 5

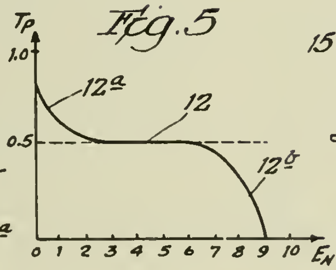

Fig. 8

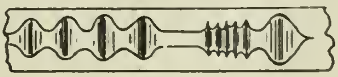

Fig. 7

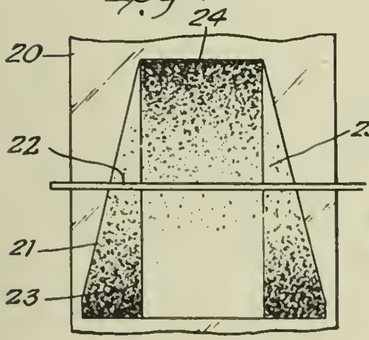

Fig. 9

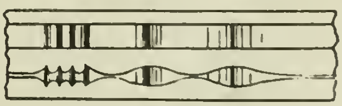

Fig. 10

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Published May 18, 1943 Serial No. 380,744

ALIEN PROPERTY CUSTODIAN

DEVICE FOR OSCILLOGRAPHING ELECTRICAL OR MECHANICAL PROCESSES

Cornelis Dorsman, Maximilien Felix Reynst and Romijn Veldhuizen, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed Febuary 26, 1941

The invention relates to a further improvement in the device for oscillographing electrical or mechanical processes as described in Patent Specification No. 203,187, wherein variations of an impedance which is spatially separated from the point of indication, which variations correspond to these processes, modulate a high-frequency generator and wherein these modulated oscillations influence an oscillograph or other indicator, if desired after amplification and/or detection. With the device set out in the above-mentioned Patent Specification the variable impedance forms part, both electrically and mechanically, of a bridge which is therefore arranged at the point where the processes take place and which may be connected by conductors of any length desired both to the high-frequency generator and to the indicator. This bridge may be brought into equilibrium by re-adjusting one of the four impedances of which it consists.

A device as referred to above is represented in Fig. 1 of the accompanying drawing, which corresponds to Fig. 1 of the said Patent Specification No. 203,187 and which therefore will not be described hereinafter anew in full details.

Two dotted rectangles **2** and **3** represent two devices arranged at the points where the processes to be watched take place, each of these devices consisting substantially of a bridge-connection wherein the impedances varying with the processes are represented by condensers **25** and **34** respectively, said condensers being shown as variable ones. The two bridges may be brought into equilibrium by re-adjusting two variable condensers **26** and **35** respectively.

This device has various drawbacks. Firstly, there is a risk of the amplifiers **4** and **5** to which the measuring currents are supplied being overloaded, since, in connection with the drift of the various values which is liable to occur in course of time, one is compelled to adjust the bridge rather far from its state of equilibrium so that there always flows a rather heavy high-frequency current. Secondly, also in connection with the drift of the electrical values of the bridge, it will be necessary to take steps for compensating this. And finally it may be necessary to arrange the bridge at a badly accessible point where readjustment of the position of equilibrium is consequently difficult or impossible.

According to the invention, all these drawbacks may be obviated by effecting the re-adjustment not in the bridge itself but at any desired point of the conductor leading from the bridge to the indicator (or amplifier), namely by supplying to this point a voltage regulable in phase and in value.

At the start of each observation, no matter how is the state of equilibrium of the bridge taken in itself, the indicator may now be adjusted to the desired starting point and this may be effected at the point most appropriate therefor, for example at the indicator.

Fig. 2 of the accompanying drawing represents one practical example wherein only those parts which are essential for the proper understanding of the invention are copied from Fig. 1.

A high-frequency generator **1** supplies current not only through conductors **41** and **42** to a bridge **23—24—25—26** but also, by means of a winding **64** coupled with the winding **8**, to a circuit consisting of a potentiometer **62** in series with a phase rotator **63** of any desired type.

By means of the former it is the amplitude and by means of the latter it is the phase of the voltage across a winding **61** coupled with a secondary winding **60** included in the conductor **28**, which may be regulated. In this conductor may consequently made operative a voltage which has the frequency of the generator **1**, said voltage being regulable in value and phase. With the aid of this auxiliary voltage it is consequently possible to adjust the zero-point of the indicator from any desired point, independently of the state of equilibrium of the bridge. The condenser **26** of this bridge need therefore not be variable, which is beneficial to the, often desired, solid construction of the apparatus **2**.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

C. DORSMAN ET AL
DEVICE FOR OSCILLOGRAPHING ELECTRICAL
OR MECHANICAL PROCESSES
Filed Feb. 26, 1941

Serial No.
380,744

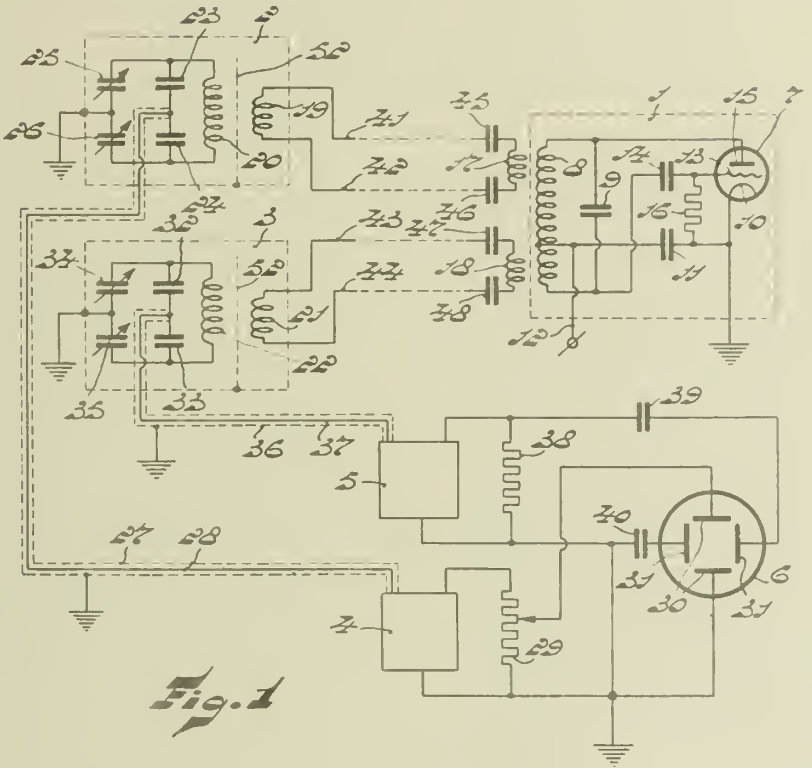

Fig. 1

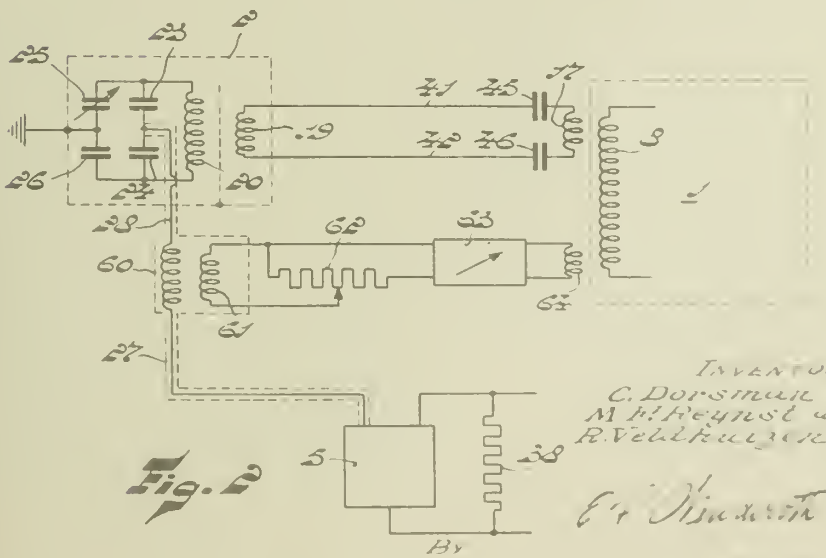

Fig. 2

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ALIEN PROPERTY CUSTODIAN

PRESSURE OBSERVER

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Application filed February 26, 1941

For pressure measurements use is often made of a diaphragm which is exposed to the pressure to be measured and constitute one of the electrodes of a condenser in which the distance between the two electrodes consequently varies with the pressure to be measured.

Usually this condenser is screwed, either directly or set in a holder, into a hole in the wall of the vessel in which the pressure variations must be watched (for instance the cylinder of a combustion motor).

Of course it is desirable that the capacity of the condenser should be acted upon solely by the pressure to be measured and, for instance, not also by temperature variations nor by strains set up in the material upon tightening screws.

The present invention provides a construction by which these conditions are satisfied.

According to the invention the diaphragm constitutes the bottom of a cylindrical tube which is freely suspended in a bore of the holder and which makes a tight fit with this holder at the top.

The said bore of the holder may be closed by a perforated wall at the bottom side.

Further particulars of the invention may appear from the following, in which one form of construction of a pressure observer according to the invention is described by reference to the accompanying drawing.

A steel holder 1 has a polygonal, for instance a hexagonal upper end, whereas its bottom end is furnished with an external screw thread by means of which the holder can be screwed into a wall, for instance a cylinder wall. The holder has an internal cylindrical bore which at the top is wider than at the bottom. The upper wide part is internally provided with a screw thread, in which is screwed a hollow steel cylinder 2 whose bottom end 4 is so much thinner as to fit with a small amount of play in the lower bore of the holder 1. A shoulder of the cylinder 2 rests on a copper ring 3 together with which it forms an obturation. At the bottom side the cylinder 2 is closed by a diaphragm 3 made from thin special steel and secured by welding. The flat part of this diaphragm together with a metal plate 6 closely arranged above the diaphragm constitutes a condenser whose capacity depends on the momentary deflection of the diaphragm. The plate 6 is secured to the bottom of a thickened part 7 of a metal shaft 8 on which is slipped a small cylinder 10 of ceramic material which by means of a collar 9 and a set screw is kept pressed against the thickened part 7. The cylinder 10 fits in the bore of cylinder 4 and is pressed at the bottom against a re-entrant edge of this cylinder by means of a thrust piece 11 and a ring 12 screwed into the cylinder 2.

For the reason stated hereinafter the bore in the holder 1 does not extend to the bottom, but there is left a wall 13 having a thickness of several millimetres in which are provided a number of perforations 14. Obviously the distance between the parts 5 and 6 is entirely independent of the force at which the holder is screwed into the wall of the cylinder, but also of the force at which the cylinder 2 is fastened and tightened in the holder. By a suitable choice of the material of parts 4, 5, 6 and 7 provision has furthermore been made that the air-gap between 5 and 6 does not change on the occurrence of temperature variations.

When the pressure observer is used for the cylinder of a combustion motor in which, of course, high temperatures occur provision must be made for sufficient cooling of the diaphragm and/or for adequate protection thereof against the hot gases. Cooling can be promoted by coating the parts 4 and 5 with a layer or foil of a metal of high thermal conductivity such as copper or silver. The said protection primarily afforded by the perforated wall 13 and in addition, if required, by inserting one or more mica plates between the said wall and the diaphragm 5.

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PUBLISHED
MAY 18, 1943.
BY A. P. C.

M. F. REYNST ET AL
PRESSURE OBSERVER
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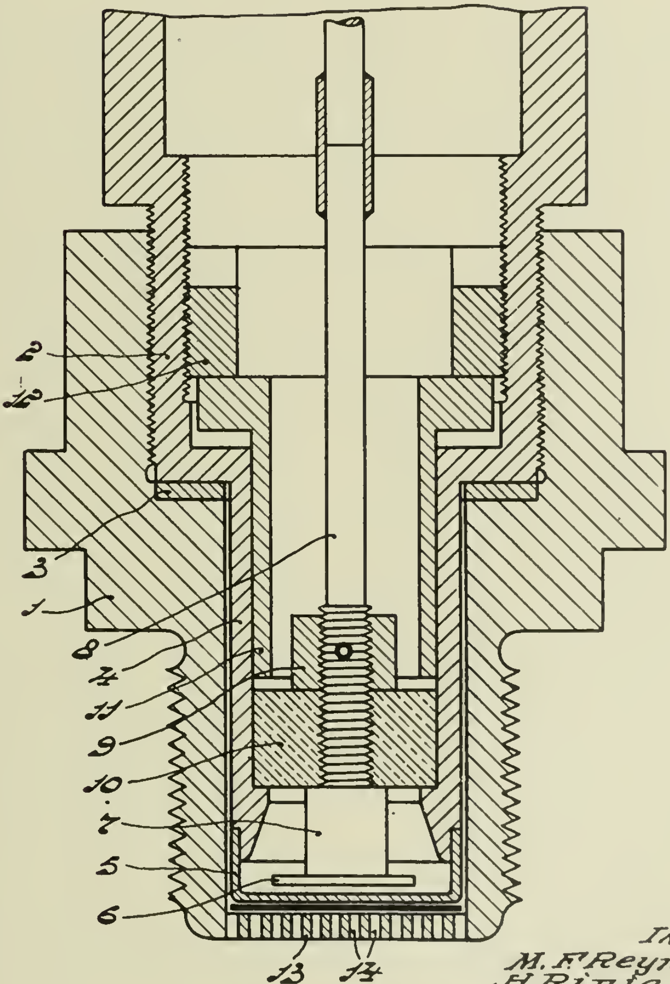
380,745



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BY
[signature]
ATTORNEY

Published May 18, 1943 Serial No. 380,869

ALIEN PROPERTY CUSTODIAN

RF VARIOMETER COMPRISING SHIFTABLE DUST CORE

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Application filed February 27, 1941

It is known in the art that the capacity of condensers and the inductance of coils are dependent upon temperature. For a certain frequency the temperature dependency of the inductance of an oscillatory circuit may be compensated, as known in the art, by an equal and opposite temperature-dependent capacity. However, this compensation is more difficult if the oscillatory circuit is tunable inasmuch as the temperature dependency is not the same for every position of the rotary condenser or variometer. This difficulty could be precluded most readily if the temperature dependency of all parts of the oscillatory circuit could be made equal to zero. However, this is not possible in practice. On the other hand, it is possible to drive a condenser by positively acting means simultaneously with the tuning, for instance, of a variometer, the capacity thereof remaining constant while the temperature dependency of the capacity varies. In this manner the temperature dependency of the variometer for the different positions could be compensated by means of the said condenser. However, an arrangement of this type would be rather complex and expensive. The invention discloses a simpler method.

According to the invention, which is particularly important and useful in the reception of short waves, the dust-core of an RF variometer has such a temperature dependency of the permeability that the percentage dependency of the inductance upon temperature variation is practically the same for all positions of the dust-core. It is then possible to compensate the temperature dependency of the inductance by an opposed temperature dependency of the capacity of the oscillatory circuit.

Figure 1 shows an exemplified embodiment of a variometer to which the object of the invention is applied. The coil turns are arranged on the form K. The dust-core M is shiftable inside the form, in the direction of the arrow, by means of screw S. The screw may be rotated in the guide F. It is expedient that form K should consist of ceramic material having a small temperature coefficient and that screw S be of a material having a small temperature coefficient since for equal percentage material deviations the absolute deviations of the material characteristics are smaller than for lower quality material.

It is not possible in all cases, in applying the invention, to use a single type of dust-core since the temperature dependency of the inductance of the variometer is determined not only by the material of the form but also by the dimensions of the coil. What is important in particular is the ratio of the length of the coil to the diameter as well as the pitch of the turns. Even without the dust-core the temperature dependency of the inductance is dependent upon the outer dimensions of the coil. This is due to the fact that an increase in the diameter of the coil as a result of thermal expansion acts in a manner so as to increase the inductance, while an increase in length of the coil acts so as to decrease the inductance.

In a similar manner the action of the dust-core upon the temperature dependency of the coil inductance differs according to the outside dimensions of the coil. By shifting the dust-core inwards, the coupling relations between the turns of the coil are varied, which, physically speaking, is tantamount to a variation of the coil dimensions. Thus, without the invention, the temperature dependency of the coil without dust-core is simultaneously varied as the dust-core is shifted in. Even if the invention is applied, in general it is not possible to make conditions so that the temperature dependency of the inductance remains the same for every position of the dust-core, but when applying the invention a dust-core of such a type is employed that the variation is as small as possible. Figure 2 shows the dependency of the factor T_k (variation of inductance/degree C.) upon frequency f of a practical embodiment of the variometer, in other words, the dependency upon the position of the dust-core in the coil. When making use of the invention a dust-core of such type is used that the actual curve comes as close as possible to the dash-line curve which represents a mean value. It can be seen that the largest deviation of the factor T_k equals 5.10^{-6} (contradistinct to the usual type of dust-core having a T_k equal to about 50 to 200.10^{-6}). The variation of the frequency per degree C. is thus one-half, that is, $2.5.10^{-6}$ since for small inductance variations the frequency variation is one-half as large as the inductance variation. For comparison's sake there may be mentioned that the frequency variation per degree C. for normal quartz is about equal to 1.10^{-6}. A frequency variation of $2.5.10^{-6}$ per degree C. results in a frequency variation of $2.10^{6}.2.5.10^{-6}=5$ cycles per degree C. for 2000 kc (150 m.). The practical production of a dust-core according the invention is predicated on the fact that a dust-core with positive and negative temperature dependency of the permeability may be produced. The latter depends upon the type of iron, the insulation material, the

mixture ratio, the moulding pressure, the temperature during moulding or pressing as well as the production method. For carrying the invention into practice the dust-core may comprise two (or more) partial cores which, for instance, are cemented together so that in each cross-section both parts come to act. Care may be taken at the same time by suitable shaping of the partial cores that at different parts of the dust-core the two parts of the cross-section are of different size to the end of approaching the dash-line, so that, as the dust-core is shifted into the coil, parts with varying characteristics are sequentially introduced. However, the dust-core may also be produced by mixing together different types of dust-core material while taking into account the different influences mentioned above, it being possible also in this case to choose different temperature dependencies of the permeability for different parts of the dust-core.

It is not necessary to measure the temperature dependency of the dust-core permeability since this is not of importance; but what is of importance is that the existing temperature dependency of the inductance varies as little as possible upon introduction of the dust core.

In an experiment and test it was shown that for a greater pitch of the turns the dust-core must have a greater temperature dependency of the permeability. Thus, the most favorable values must be determined by experiment in each case.

ALFRED NOWAK.

PUBLISHED A. NOWAK Serial No.

MAY 18, 1943. RF VARIOMETER COMPRISING SHIFTABLE DUST CORE 380,869

BY A. P. C. Filed Feb. 27, 1941

Fig. 1

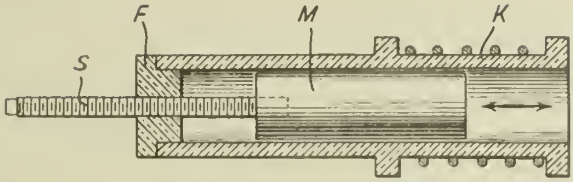


Fig. 2

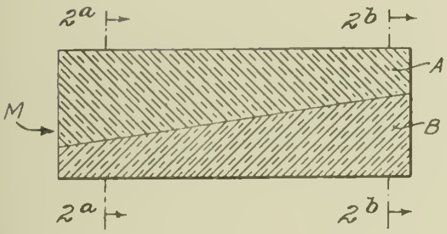


Fig. 2a

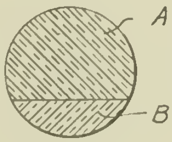


Fig. 2b

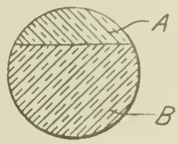
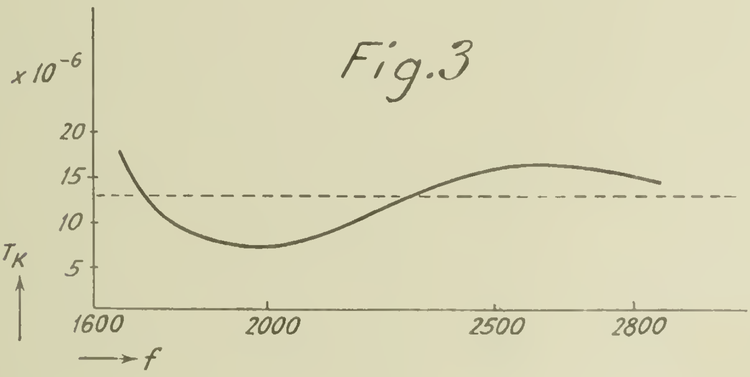


Fig. 3



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Published May 18, 1943 Serial No. 380,914

ALIEN PROPERTY CUSTODIAN

PROCESS FOR CONTROLLING FRACTIONATION

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Application filed February 27, 1941

The present application is a continuation-in-part of application Serial Number 187,089, filed January 26, 1938.

The present invention relates to a process for continuously controlling certain characteristics and properties of the products of a fractionation column. While the process may be used in connection with the fractional distillation of any liquid mixture it is particularly suitable for controlling the fractionation of petroleum products and mineral oils. During the distillation of oil it is usual to reflux part of a fraction in order to obtain a more definite boiling point range and consequently a purer product. By controlling the quantity of reflux it is possible to control the temperature of the fraction and various characteristics of the product. It is known, for instance, to test distill a small quantity of the distillate from the main fractionation column for the purpose of determining the final boiling point of the distillate. Variations in this boiling point may be used to increase or decrease the reflux and so control the final boiling point of the product. Also various other methods and devices have been proposed for controlling different characteristics and properties of liquid mixtures produced by distillation.

The object of the present invention is to provide a method for controlling the quantity of the various components of the desired product. In the case of gazoline, for instance, definite specifications must be complied with For example, it may be required that 10% of the gasoline vaporize at a given fixed temperature between 30° C. and 60° C., 40% between 60° and 120° C., 90% between 120° and 180° C. and the remaining 10% between 180° and 200° C. For the purpose of describing the present invention, these requirements will be assumed, although any other percentages and temperature ranges may be set as a standard without departing from the spirit of the invention. The above mentioned requirements may be expressed as follows:

	°C.
Initial boiling point	30
10% vaporizes below	60
50% vaporizes below	120
90% vaporizes below	180
Final boiling point	200

Broadly, the invention consists in partly distilling a small sample of the distillate from the main fractionation column so that a residue or high boiling fraction remains in the bottom of the test distillation column. This residue is permitted to flow through a device which is responsive to variations in the rate of flow of the high boiling fraction or residue. This device operates a valve in the reflux line leading to the main column so that a variation in the quantity of the residue in the test column causes a change in the rate of reflux in the main column. In this manner it is possible to accurately and automatically control the percentage of a particular component of the desired final product.

In the past the rate of reflux, or reflux ratio, has been controlled by placing a thermostat in the main fractionating column near the point where the particular fraction or cut is removed from the column, said thermostat controlling the reflux valve. This method is adapted to automatically control the temperature of distillation of the cut. However, the quantities of the various components of any particular cut are dependent not only on the temperature in the column but also on the pressure existing at the point where the cut is removed. Even though the temperature may be kept constant, for instance, at the head of the column, the vaporized product issuing from the column will vary if there are variations in the pressure at this point. But variations of the composition may be also caused by many other factors, the most important of which are changes in the composition of the original material introduced into the main fractionation column, variations in the composition of the distillate, variations in operating pressure, etc. According to the present invention the reflux is varied so that the product conforms to certain predetermined values, the temperature at the top of the column being varied so as to uniformly maintain the properties of the distillate.

In particular the process consists in fractionating oil as it comes from stills and then continuously fractionating a small sample portion of a cut, the characteristics of which it is desired to control. The second or test fractionation is carried out at a lower temperature than the main fractionation so that a part of the sample portion will not be distilled. This liquid residue is allowed to run off continuously in such a manner that any variation in the quantity of residue per unit of time will cause a variation in the reflux ratio to the main fractionating column. For instance, if the rate of flow of the residue in the test column increases beyond a predetermined value, the reflux in the main column will be increased thereby reducing the temperature at the top of the main column. This reduction of temperature will prevent some of the higher boiling constituents from passing off and thereby reestablish the desired proportion of the higher boiling constituents in the final product.

Referring to the standards described above, let it be assumed that the final product is to consist of a 10% component vaporizing between 180° and 200° C. In this case the temperature at the bottom of the test column is maintained at say

180° C. so that all constituents boiling below 180° C. will be vaporized. It is presumed that the vapors issuing from the main column do not contain any constituents which boil above 200° C. A sample of the vapors coming from the main column is continuously condensed and then supplied to the test column where the residue (B. P. 180° C. to 200° C.) collects at the bottom. This residue is allowed to flow continuously through a device which will become operative when the flow of residue varies. Obviously this device must be adjusted according to the particular amount of the sample which is employed in the test fractionation. If the amount of residue increases, the device will operate the reflux valve to increase the reflux and thereby decrease the temperature at the top of the main column. This in turn reduces the amount of the component boiling between 180° and 200° C. until the proper proportion has been reestablished. Alternately if the amount of residue decreases the reflux ratio is decreased so that the temperature at the top of the main column is increased and consequently the proportion of the high boiling component in question increases.

Obviously, if it is desired to control the 50% residue which boils between 120° and 200° C. it is only necessary to adjust the temperature at the bottom of the test column and to make corresponding adjustments in the valve operating device.

In order to more clearly describe the invention reference is made to the accompanying drawing which constitutes a diagrammatic illustration of one arrangement for carrying out the process.

In the drawing, 1 is the main fractionating column into which the oil or other liquid mixture partly vaporized is fed at 2. The vapors are led off at 3 and passed through a condenser 4. The resulting liquid passed into a separator or settling tank 5 from which the final pure fraction is taken off at 6. Any water which separates out is taken off at 7 and the uncondensable vapors at 8. Some of the final product is permitted to flow over the plate 5′ into a chamber from which it is drawn by pump 9 into the reflux pipe 10. Interposed in this pipe is a reflux control valve 11 which controls the amount of liquid returned to the main fractionating column. The valve 11 is controlled as hereinafter described.

Before the vapors reach the condenser 4 a small portion of them is allowed to pass through the valve 12 and pipe 13 to the condenser 14. The resulting liquid will be termed the test liquid. From the condenser 14 the test liquid passes through a separator or settling tank 15 which like the tank 5, permits removal of water at 16 and uncondensable vapors at 17. 18 is an overflow pipe.

The test liquid then passes through a flowmeter 19 into the test distillation column 20. This column may be of the bubble-plate type and is heated by resistances or heating elements 21, 22, 23 and 24, which are controlled by a circuit breaker 25. A thermocouple device 26 controlled by the temperature in the bottom of the texte column 20 operated the circuit breaker 25. At the bottom of the column 20 the heating element 21 is maintained at a predetermined temperature lower than the final boiling point of the test liquid being distilled. The residue which collects at the bottom of the column 20 passes through a device which measures the rate of flow. This device, in turn, controls the reflux valve 11.

For the purposes of the present invention, any type of valve operating device responsive to liquid flow may be used, but the device shown in the drawing will be described in detail.

The residue leaves the test column 20 through the pipe 27 and then passes through a cooler 28 so that the liquid will have a definite and uniform temperature when it passes through the valve operating device. After being cooled to a definite temperature the liquid passes through the double syphon 29 and 30 into the tube 31. The tube 31 has a variable outlet 32 through which the liquid passes. A float 33 is arranged within the tube 31 which is adapted to rise or fall within the tube according to whether the liquid rate of flow increases or decreases. On the float 33 a rod 34 is mounted which rises and falls with the float. The movement of the rod is utilized to operate the reflux valve 11 and this may be accomplished either by mechanical, electrical or pneumatic means or a combination of these. The rod 34 may also be used to operate an indicator which is calibrated to show the change in rate of flow, the proportion of undistilled test liquid to the whole sample or any other characteristic. The indications may then be used as a guide for changing the flow through the reflux valve 11.

In the modification shown in the drawing, the rod 34 is provided with a rack at its upper end cooperating with a pinion 35. This pinion operates an escape-valve 36 which controls the amount of compressed air acting on the valve 11 through the pipe 37. A source of compressed air is indicated at 38. It therefore follows that a variation in the amount of residual liquid in the test column 20 will be reflected through the valve control device to the valve 11. It is clear that a direct mechanical connection between the rod 34 and the valve 11 may be used if the arrangement of the apparatus at the distilling plant is suitable.

In order that the operation of the test column be as accurate and uniform as possible, it was necessary to eliminate variations of all factors which may influence the test distillation. It is therefore essential to maintain a constant and uniform flow of the test liquid through the flow meter 19, a constant pressure within the column 20 and a constant temperature. To accomplish this, the vapors issuing from the test column 20 are passed through a condenser 39 and pipe 40 into the vessel 41 which is kept at a constant pressure. The uncondensed vapors which are passed through the pipe 17 are led into the vessel 41. The pressure in the vessel 41 is transmitted through the pipe 42 and controls the valve 43. This valve permits excess vapors in pipe 17 to be exhausted through the pipe 44.

If for instance, the pressure in the main column 1 increases, this increase is transmitted through valve 12, pipe 13, tank 15, pipe 17 to the vessel 41. The valve 43 is then opened until the desired pressure in pipe 17 and tank 15 is reestablished. By maintaining a constant pressure on the liquid in tank 15 a constant and uniform flow into the test column 20 is assured. This in turn ensures a constant and uniform operation in the test column 20 which is essential to a correct and accurate operation of the means controlling the reflux valve 11.

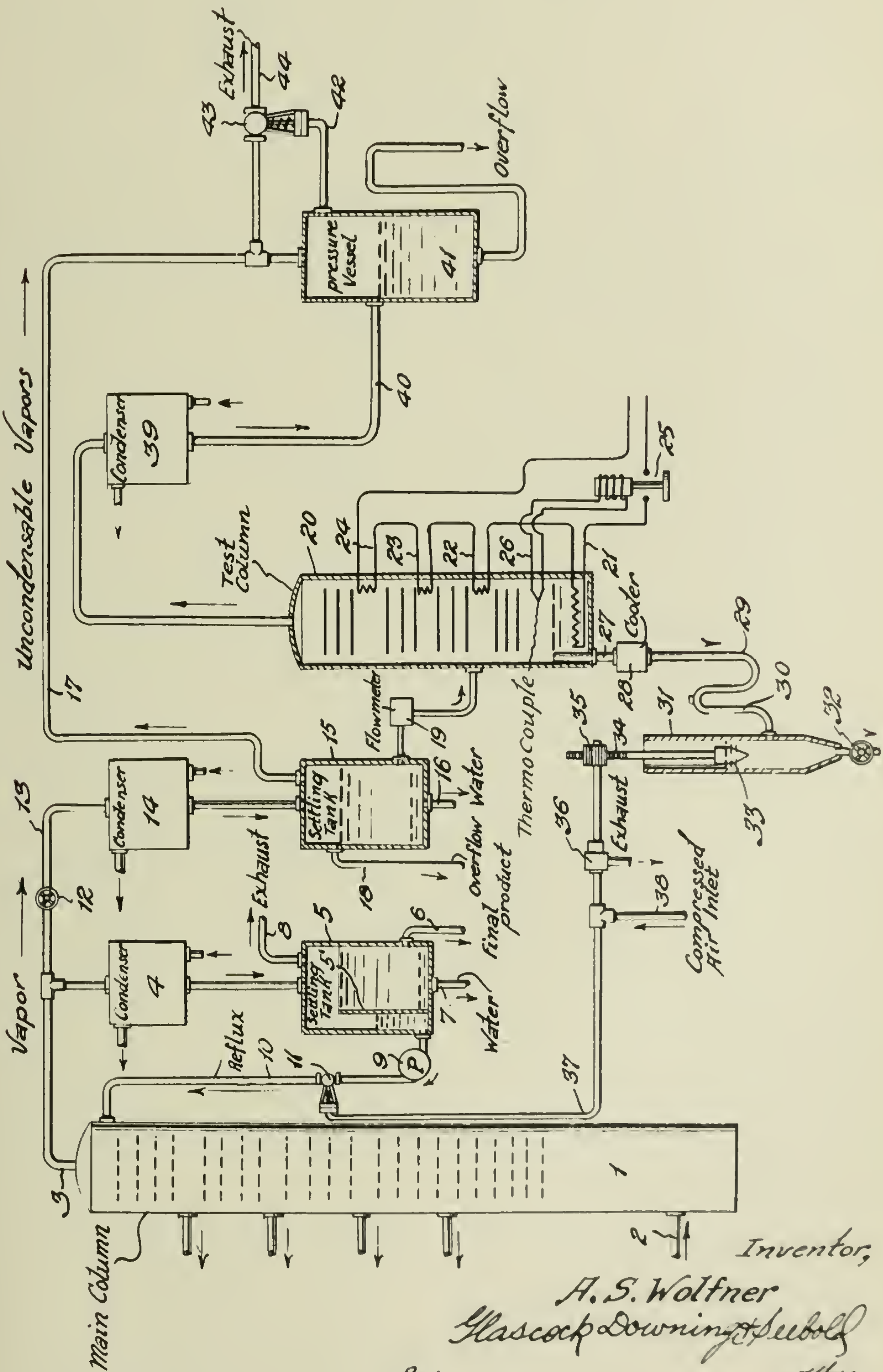
It will be clear from the foregoing that various modifications may be employed without departing from the spirit of the present invention.

ALFRED SAMUEL WOLFNER.

FUBLISHED
MAY 18, 1943.
BY A. P. C.

A. S. WOLFNER
PROCESS FOR CONTROLLING FRACTIONATION
Filed Feb. 27, 1941

Serial No.
380,914



Inventor,
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By: Glascock Downing & Seebold
Attys.

Published May 18, 1943

Serial No. 380,962

ALIEN PROPERTY CUSTODIAN

INTERRUPTER OR ELECTRIC CURRENT INTERRUPTER AUXILIARY DEVICE WITH A COUNTER ELECTROMOTIVE FORCE GENERATOR

Alfredo D'Arbela, Firenze, Italy; vested in the Alien Property Custodian

Application filed February 27, 1941

The aim of the present invention is the instantaneous obtainment in a circuit traversed by a continuous, alternating or pulsating electric current, the generation of a counter electromotive force adapted to give rise or facilitate the reduction or interruption of the current circulating through same, in such a manner as to enable the securing, according to the system of interrupters of relatively reduced dimensions, such as to completely insulate the breaking process from its surroundings.

The invention essentially concerns:

1. The fact that the metallic continuity of the circuit may, in a determined section thereof, be replaced by an arc at break, this arc being located within an empty intermediate space being plane, annular (circular or otherwise) in cross section, within which a magnetic field is created, whose direction is approximately normal to the side walls of the said intermediate space. Due to the effect of the said field, the arc is urged to move rapidly in a tangential direction, shifting points of contact with the electrodes, while, on its repeatedly re-traversing the annular space above alluded to, it imparts a continuous motion to the gaseous stratum contained within the intermediate space;

2. The fact that, due to the effect of the said movement within the magnetic field, there is generated in the column of electrically conducting gaseous substance constituting the arc, a counter electromotive force, proportional to the arc displacement velocity and to the intensity of field, which tend to impede the passage of the current, there by gradually limiting the value of same, and increasing to the point of occasioning the extinction of the arc, or else of greatly facilitating the interruption of the current at some other point of the circuit.

The entire process as described above takes place within an electrically insulated space, separated from the exterior.

The invention will be best understood from the following specification, together with the accompanying drawing, which shows, schematically and solely by way of example, one form of application of the said invention.

In the said drawing

Fig. 1 shows an electric current interrupter as embodied according to the system in longitudinal section;

Fig. 2 is a horizontal section of the same interrupter.

It is apparent from the drawing that a bell or petticoat *a* carries, centrally, a core *b*. Between the core and the internal walls of the cup or petticoat there is formed an empty intermediate space *c* being completely coated with insulating material, viz: the core *b* is coated with refractory material *d*, or the like, and the inner walls of the bell or petticoat with refractory material *e* or some other suitable material.

At the upper part of the intermediate space, and comprised between the coatings or linings *e* and *d* there is located a ring *f*, in function of a contact. A tube-shaped element *g* of conductive material is destined to enter the intermediate space *c* in order to proceed to contact with the ring *f*.

Upon the iron core *b* and precisely about the upper portion of same, there are wound the turns *h* in function of a coil, supplied either independently or in series or in shunt on the circuit to be broken. It may be convenient to form the intermediate space *c* in the shape of a truncated cone, rather than in a cylindrical shape, when the device is intended to interrupt the current by extinguishing the arc generated in same with a view to promoting the secondary action of driving up the gaseous current, whose formation is due either to thermic effect, or to centrifugal force owing to rapid rotation.

Within the intermediate space *c* there is located on the detachment of the fixed and movable contacts *f* and *g* respectively, the break arc which remains between the said contacts, spaced apart due to the effect of a controlling device of any description (mechanical, electromagnetic, electro-pneumatic etc.). The radial magnetic field is originated due to the effect of the current traversing the exciting turns *h* wound about the iron core *b* whose annular intermediate space *c* represents the air-gap.

The thicknesses *e*, *d* protect the apparatus from the destructive action of the arc.

The said arc, located within the annular intermediate space, moves rapidly—in virtue of the magnetic field whose direction is approximately normal to the side walls of the above intermediate space—in a tangential direction shifting its points of contact with the electrodes, and re-traversing repeatedly the said annular space, while continuous motion is imparted to the stratum of gas in the intermediate space, so that, due to the said movement, and to the generation of the counter electromotive force, the value of the arc itself is limited to the point of the extinction of same.

It is understood that the drawing constituted but a schematic form of example, given solely by way of a practical showing of the invention, it being possible for said invention to be varied as to its forms and arrangements, without thereby departing from the informative concept upon which it is based.

ALFREDO D'ARBELA.

[illegible]

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MAY 18, 1943.

BY A. P. C.

A. D'ARBELA

INTERRUPTER OR ELECTRIC CURRENT INTERRUPTER AUXILIARY DEVICE WITH A COUNTER ELECTROMOTIVE FORCE GENERATOR

Filed Feb. 27, 1941

Serial No. 380,962

Fig. 1

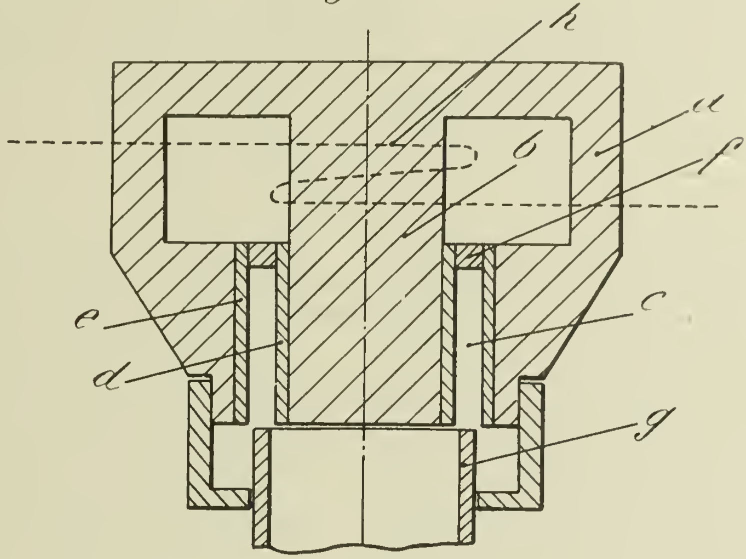
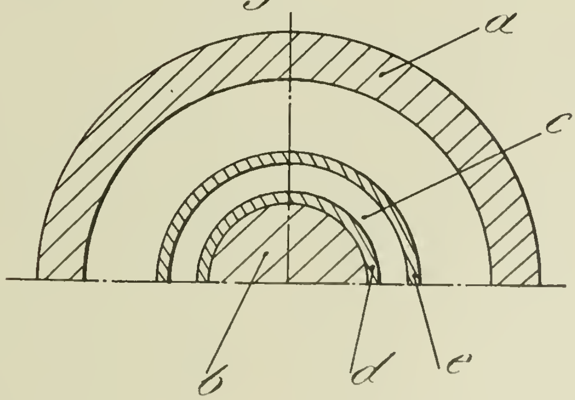


Fig. 2



Inventor.

Alfredo d'Arbela

by Singer, Ehlert, Stern
Carlberg

Attorneys

Published May 18, 1943 Serial No. 381,164

ALIEN PROPERTY CUSTODIAN

HYDRAULIC SHOCK ABSORBERS

Wilhelm Zenz, Wuppertal-Elberfeld, Germany; vested in the Alien Property Custodian

Application filed February 28, 1941

The present invention relates to a single acting or double acting hydraulic shock absorber particularly for deadening or dampening relative movements between the axis of a vehicle on the one hand and the chassis or underframe and the carriage body on the other hand. The invention consists in so constructing the shock absorber that it not only acts as absorber but over a certain range also as stabilizer without requiring the pipe connections between the absorber cylinders at the two ends of the axis used ordinarily in connection with hydraulic stabilizers. With the absorber according to the present invention a shock absorption is effected at the beginning in a first range of dampening, but on exceeding a certain amplitude, the vibrating motion is totally or nearly totally braked and only if a certain higher tension, exceeding the braking force, is attained again between the carriage body and the axis, that is to say, in a second range of dampening a further absorption of the vibrations is effected.

To obtain this object a liquid filled hollow space is provided according to the invention in the absorber piston which hollow space is closed by a spring-loaded piston guided in the absorber piston, a throttling device for the liquid displaced from the hollow space being provided either at the absorber piston or at the small piston.

A substantial feature of the invention consists in this that the discharge opening for the liquid displaced from the hollow space as well as the suction opening by which liquid is admitted again to the hollow space if the small piston returns discharge into the pressure space of the absorber. Hereby the following substantial differences in action and advantages result:

With slow movement of the small piston, for instance if the vehicle takes a curve, the liquid displaced from the hollow space flows into the pressure space behind the absorber piston and here produces an overpressure which, however, is not yet sufficient to open the high pressure valve arranged between the high pressure side and the low pressure side of the absorber, but is capable of displacing the large piston in a direction opposite to the movement of the small piston so that the large piston moves towards the small piston. Consequently the small piston bears against the inner side of the bottom of the large piston earlier as would correspond to its normal stroke according to its starting position and the stabilizing begins earlier about this section of the stroke performed by the large piston which is very desirable. At fast movement of the small piston, however, the liquid from the hollow space between the pistons is supplied with a jerk into the high pressure space and the high pressure valve is forced open by the high pressure suddenly occurring, whereby the large piston, due to its mass inertia, remains absolutely immovable. Between these two extreme possibilities explained a large number of intermediate steps are possible in which the large piston is moved towards the small piston as well as the high pressure valve is opened already.

The shock absorber according to the invention, therefore, has the advantage that the second range of dampening automatically begins in dependence on the velocity of the movement to be dampened, i. e. an automatic control of the begin and of the duration of the individual steps is obtained.

A further advantage of the shock absorber according to the invention consists in this that by drawing the liquid out of the pressure space of the shock absorber the danger is obviated that air reaches the hollow space which otherwise by drawing liquid from a space chamber, easily may occur, for instance due to heavy vibrations of the vehicle or at low liquid level. The total device therefore operates absolutely with largest uniformity and reliability.

Further details of the invention may be seen from the following specification given by way of the accompanying drawing which shows one modification of the invention in a longitudinal section.

The shock absorber consists of two cylinders, the high pressure cylinder **1** and the low pressure cylinder **2** with pistons **3** and **4** respectively which are driven from the shaft **6** by a cam lever **5**. In the pistons **3** and **4** which consist of cylindrical sleeves with inserted bottoms **9** and **10** respectively held by retaining rings **7** and **8** respectively smaller pistons **11** and **12** respectively are guided which bear against the piston bottoms **9** and **10** by springs **13** and **14** respectively. The hollow spaces **15** and **16** formed between the large pistons and the small pistons are connected to the high pressure space **17** and the low pressure space **18** respectively by a passage **19** and **20** respectively and the suction valves **21** and **22** (snifting valves) respectively. The valves **20** and **21** preferably are arranged in the exchangeable piston bottoms **9** and **10** respectively. To compensate for a liquid loss eventually occurring in the system, a suction valve **24** (snifting valve) leading to a spare chamber **23** is provided in the

bottom of the piston 12. The passages 19 and 20 generally consist of smooth bores the diameter of which is from the beginning adapted to the weight of the vehicle and to the force acting upon the shock absorber respectively, but these passages may also be provided with adjustable throttling devices or the like.

The high pressure space 17 is connected by way of a passage 25 to the high pressure valve 26 which discharges into a passage 27, 28 leading to the low pressure space 18. On the other hand the low pressure valve 29 connected to the passage 28 discharges by way of the bore 30 into the passage 25. The just described device acts in such a manner that at slow movements of the cam lever the pistons 3 and 4 move towards the pistons 11 and 12 respectively as indicated in the drawing by arrows. At fast movements of the pistons 11 and 12, however, the pistons 3 and 4 remain at rest and the liquid discharged from the spaces 15 and 16 by way of the passages 19 and 20 respectively produces in the spaces 17 and 18 such a pressure that the valves 26 and 29 are opened and thereby the liquid flows from the high pressure side to the low pressure side and vice versa respectively.

The movement of the pistons 11 and 12 relatively to the pistons 3 and 4 respectively is completed as soon as the pistons 11 and 12 have covered the mouths of the passages 19 or 20 respectively.

As may be seen from the drawing, the valve casings 31, 32 arranged at the exchangeable piston bottoms 9 and 10 respectively form a guide for the springs 13 and 14.

WILHELM ZENZ.

PUBLISHED

MAY 13, 1943.

BY A. P. C.

W. ZENZ

HYDRAULIC SHOCK ABSORBERS

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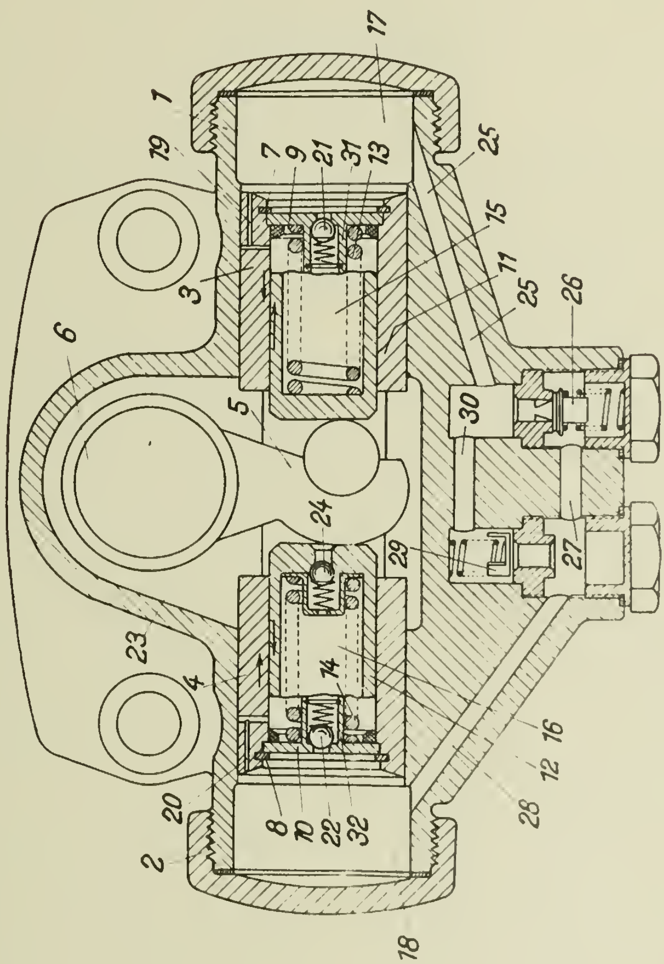

Inventor:
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Published May 18, 1943 Serial No. 381,226

ALIEN PROPERTY CUSTODIAN

SYSTEM OF TELEVISION

Georges Valensi, Paris, France; vested in the Alien Property Custodian

Application filed March 1, 1941

The invention relates to a system of television. One object of the invention is to provide a receiving television station which, without any important modification, is able to receive pictures transmitted by emitting television stations of very different characteristics.

Instead of relaxation oscillators or similar electrical generators for scanning one line of the image after the other (vertical sweep and horizontal sweep), the receiving station according to the invention embodies a device, which, by simply changing a screen having a transparency varying from one point to the other in accordance with a predetermined law, generates electric currents having the wave-forms necessary for fulfilling the scanning exactly in accordance with the characteristics of the television station sending the images that one wishes to receive.

Another advantage of the invention is to permit to secure between two private television stations (one sending and one receiving) a privacy feature of the television transmission, by using two identical series of screens having predetermined laws of transparency in said two stations, the substitution of one screen to another in each series being made manually or automatically following a predetermined order which constitutes a private code.

The appended drawing represents schematically, by way of example, one embodiment of the invention.

On this drawing, 1 represents a television receiving station which differs from those of usual construction only by the elements controlling the scanning of the image. 2 are the terminals to which the image signals proceeding from the corresponding emitting station are applied. 3 are terminals to which is applied a pilot wave (for example a pilot sine wave) proceeding from said distant emitting station; this pilot wave controls the device which generates the electric currents desired for the scanning. This device comprises a cathode ray tube 4 having a cathode 5 emitting electrons and a fluorescent screen 6 on which the electronic image (or electrical image) of the cathode 5 is obtained by means of an "electron optical device" not shown on the drawing.

The coil 7, fed by the hereabove mentioned pilot wave, produces a magnetic field which moves said electrical image of the cathode 5 on the fluorescent screen 6. Use is made preferably of a rectilinear cathode giving a rectilinear electrical image when it is necessary to generate more than one wave-form for the scanning.

The screen 8, located in front of the fluorescent layer 6, has a transparency which varies from one point to the other in accordance with a predetermined law. When a rectilinear cathode 5 is used, said screen 8 comprises two or several parts, separated from each other by straight lines perpendicular to the cathode.

The optical system 9 concentrates the light produced by the fluorescence of screen 6 through the two parts of screen 8 in the photo-electric cells 10 and 11, separated from each other by an opaque wall 14 and corresponding respectively to the two parts of screen 8. Across the output resistances 12 and 13 of these photoelectric cells 10 and 11, electric currents are obtained the instantaneous intensities of which depends on the transparency of the points of screen 8 in front of which is located the electrical image of cathode 5 at the considered instant.

In order to obtain a negative photographic proof of each part of screen 8, for example of the part corresponding to the horizontal sweep in the scanning of the received image, use may be made at the corresponding emitting television station of a cathode ray oscillograph of the Dufour type which comprises a photographic plate in a vacuum tube, an electrical image of the cathode being obtained on said plate. The hereabove pilot wave generated at the television emitting station is applied to a coil producing a magnetic field which moves said electrical image on said photographic plate whereas a modulating electrode (submitted to the action of the wave corresponding to the horizontal sweep in said emitting television station) modulates the intensity of said electrical image.

A negative photographic proof of the other parts of screen 8 (for example the part corresponding to the vertical sweep in the scanning) is obtained in a similar manner.

The negative proofs so obtained are juxtaposed and a great number of positive proofs are made on photographic film. These positive proofs constitute the screens 8 permitting for various receiving stations, the reception of the television pictures transmitted by the considered emitting station.

Each receiving station is consequently provided with a group of screens 8 corresponding respectively to the various television emitting stations, the emissions of which it is wished to receive.

If, instead of one screen 8 for each television transmission, use is made of a series of screens constituting a cinematographic film moved according to a predetermined law, it is possible to secure the privacy of the pictures transmitted be-

tween two private television stations; in such a case said stations will have scanning control elements in accordance with the invention, and the synchronism of the motions of the two cinematographic films (series of screens **8**) in the two stations is controlled by the pilot wave feeding the deflection coils **7**.

Instead of using a pilot wave applied to terminals **3**, use may be made of the fundamental wave of the current produced by electrical mains (networks of electricity distribution) if the networks feeding the receiving television station and the emitting television station are interconnected.

As a pilot wave, use may be made also of a standard synchronising frequency such as those generated in a national laboratory by means of an accurate tuning fork or similar device (frequency standard) if said standard frequency is distributed in both cities where the television corresponding stations are located respectively.

GEORGES VALENSI.

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MAY 18, 1943.

BY A. P. C.

G. VALENSI

SYSTEM OF TELEVISION

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5 Sheets-Sheet 1

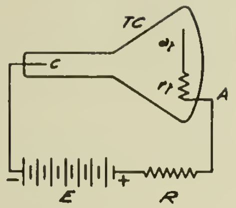

Fig:1

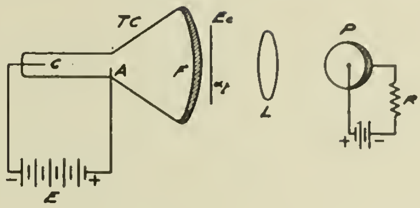

Fig:2

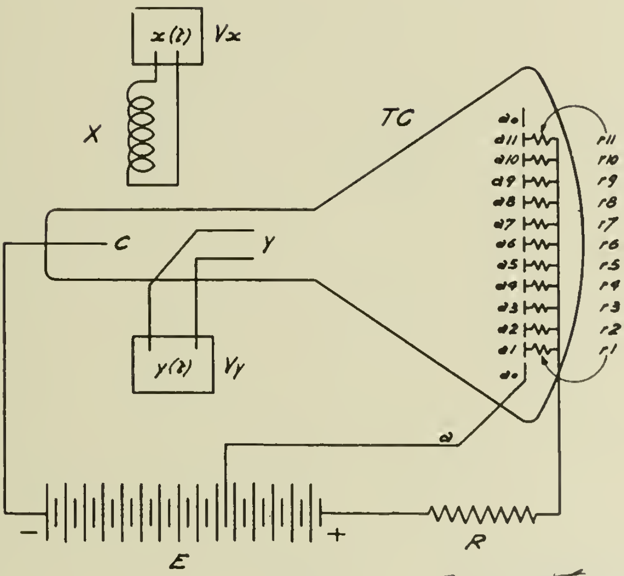

Fig:3

Inventor
Georges Valensi
by [illegible]

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BY A. P. C.	Filed March 1, 1941	5 Sheets-Sheet 2

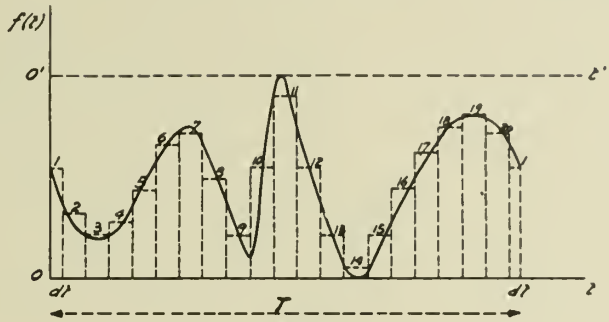


Fig: 4

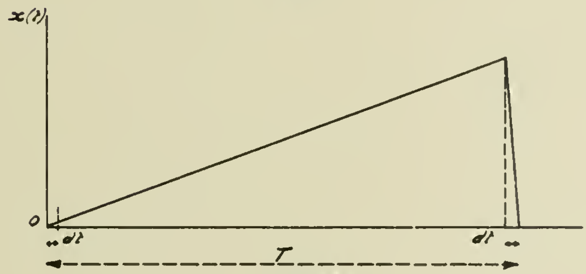


Fig: 5

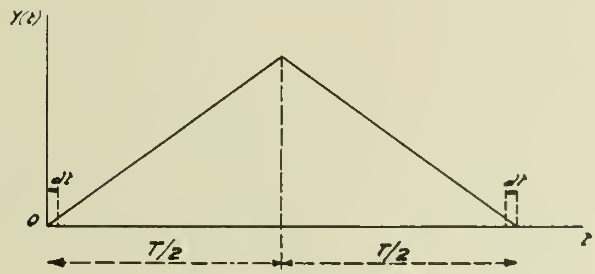
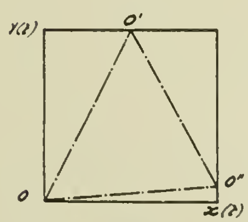
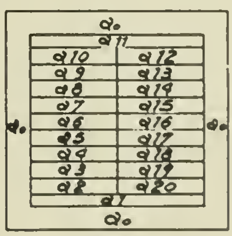


Fig: 6





Inventor Fig: 7 Fig: 8

Georges Valensi by

PUBLISHED	G. VALENSI	Serial No.
MAY 18, 1943.	SYSTEM OF TELEVISION	381,226
BY A. P. C.	Filed March 1, 1941	5 Sheets-Sheet 3

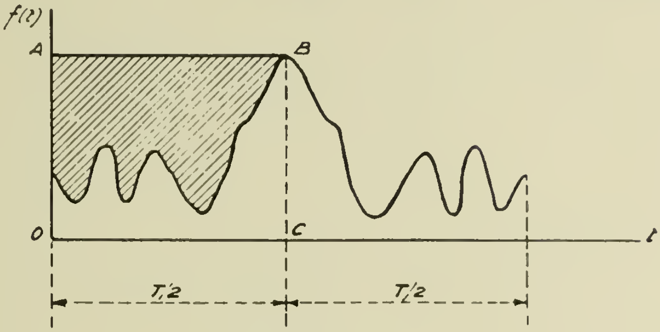


Fig: 9

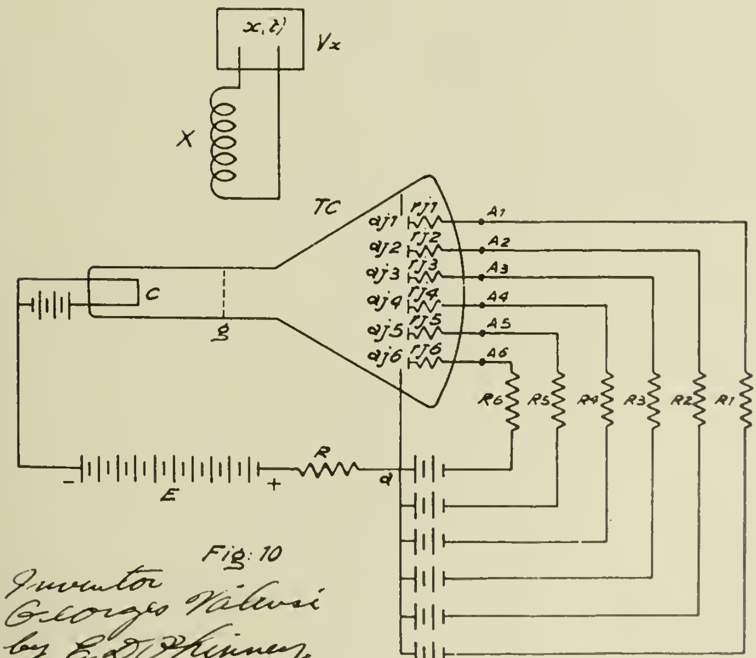


Fig: 10

Inventor
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G. VALENSI

SYSTEM OF TELEVISION

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5 Sheets-Sheet 4

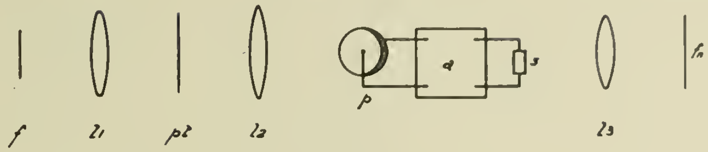

Fig:11

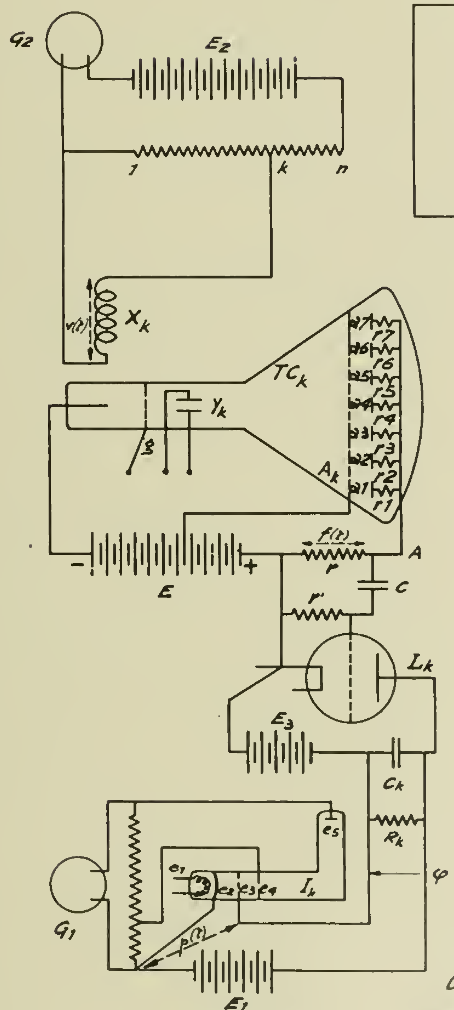

Fig:12

Fig:17

Fig:18

Fig:13

Inventor
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G. VALENSI
SYSTEM OF TELEVISION
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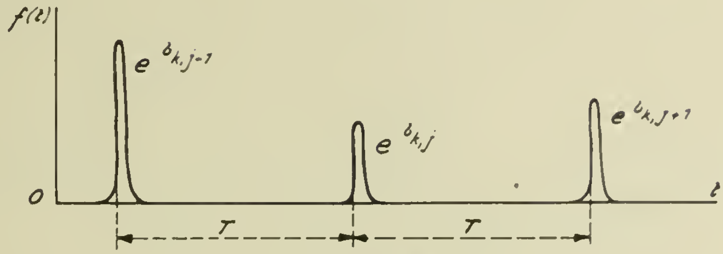

Fig: 14

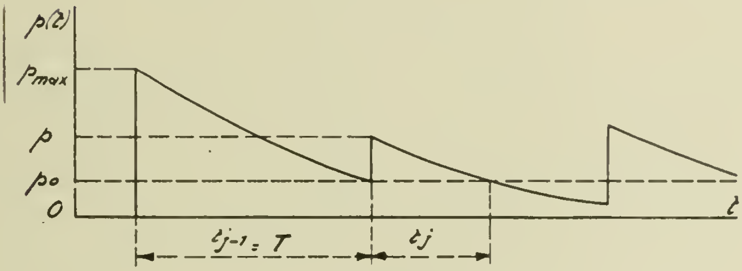

Fig: 15

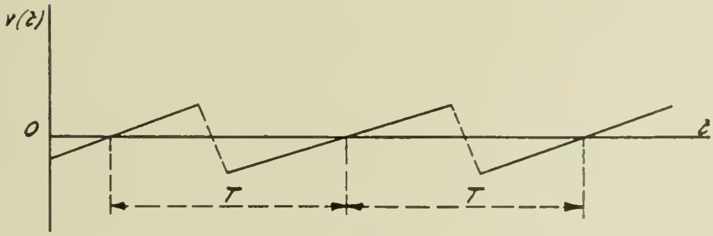

Fig: 16

Inventor
Georges Valensi
by [illegible]

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Serial No. 381,904

ALIEN PROPERTY CUSTODIAN

SIFTING APPARATUS FOR THE SEPARATION OF MAIZE HUSKS FROM MAIZE SEED AND SIMILAR MIXTURES

Felix Grandel and Karl von Gimborn, Emmerich/Rhein, and Bernhard Akens, Kleve, Germany; vested in the Alien Property Custodian

Application filed March 5, 1941

In my copending U. S. Patent application Serial No. 340,800 I have described a process and an apparatus for screening seeds, in particular maize. This process consists in that the grain seeds are either slung against a smooth hard surface, or are beaten. To separate the falling mixture of seed and husks which accumulates as a result of this, vertical separators are used, proceeding as follows; the maize seed-husk mixture is passed two, three or four times through a wind-separator until the desired separation is attained. Now it is difficult to put this process into practice, since an hourly output is involved with which the wind-separators alone cannot cope. Furthermore, even oscillating tables are not faultless, if not the mixture is presorted into four or five gradings, but this results in the continuous working process becoming expensive and too complicated.

It was now found that the accumulation of husks and seeds as developing in accordance with my copending patent application Serial No. 340,800 can be very easily and completely disintegrated into its respective ingredients if proceeded with as follows:

The mixture of husk and seed is in the first instance fed to a vertical separator, in which it is—in accordance with counter-current principles—directed against the air-current to a height of 1 to 1½ m; hereby the seed and a portion of the maize is passed up and reaches a special collective outlet. The remaining maize husk falls contrary to the air-current onto an inclined sieve from which it is sacked.

By means of this working process approximately two-thirds of the maize husks are removed. The rest of the mixture interspersed with maize seed in concentrated form reaches an oscillating table of known construction, whose horizontal bottom is arranged with projecting edges or flutes set at a special angle to the direction of motion, said edges or flutes being produced e. g. by sheet-metal plates of approximately 2 mm thickness fitted in a slat-like position one above the other. Through the to and fro motion of the oscillating table the lighter seed separates itself and passes over the flutes, thus reaching the respective seed outlet, whilst the heavier maize husk passes along the flutes to the outer wall of the casing, and from thence travels automatically into the husk outlet.

In conformity with the continuous charge to oscillating plate also the discharge separated into seed and husk takes place.

My improved apparatus can of course be utilized with the same results for mixtures constituted similarly to the maize husk-seed mixture.

In the drawing a constructional form of the invention is shown.

Fig. 1 illustrates an elevation of the total apparatus, while Fig. 2 shows a plan view of an oscillating table.

The apparatus consists of a vertical separator **1** and a shaking apparatus **2** with oscillating table **3**, at **4** the point of supply for the mixture to vertical separator, and at **5** the discharge outlet for seeded maize are shown, at **6** on oscillating sieve **3** the maize husks, and at **7** the seeds are discharged.

If desired, several oscillating tables, advantageously arranged beneath each other, or several vertical separators with one or more shaking appliances may be combined with each other.

FELIX GRANDEL.
KARL VON GIMBORN.
BERNHARD AKENS.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

F. GRANDEL ET AL

SIFTING APPARATUS FOR THE SEPARATION OF MAIZE HUSKS FROM MAIZE SEED AND SIMILAR MIXTURES

Filed March 5, 1941

Serial No.

381,904

Fig. 1

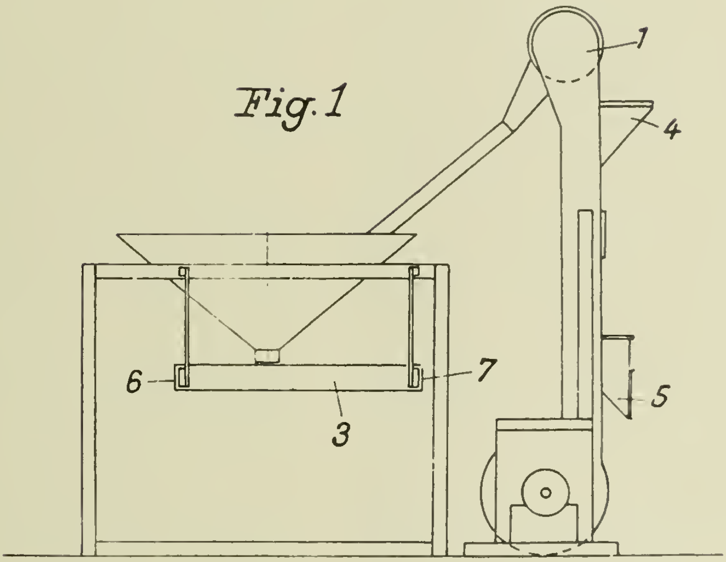
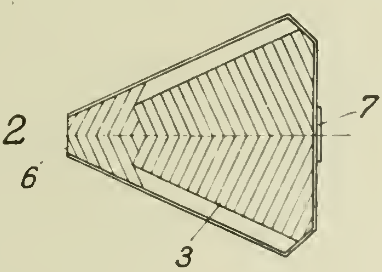


Fig. 2



Inventors:–

Felix Grandel, Karl von [illegible],
and Bernhard [illegible].

By:- Smith, Michael & Gardiner,
Attorneys

Published May 18, 1943

Serial No. 382,084

ALIEN PROPERTY CUSTODIAN

DEVICE FOR DIRECTED TRANSMISSION OR RECEPTION OF WAVE ENERGY

Karl Menges, Bremen, Germany; vested in the Alien Property Custodian

Application filed March 6, 1941

The invention relates to a device for directed transmission or reception of wave energy, particularly for transmitting and receiving sound waves. For this purpose, there are used oscillation bodies whose transmitting or receiving surface is sufficiently large in comparison with the wave lengths used. The action of these bodies depends on the directing characteristic showing the course of the received or transmitted amplitude in dependence of the direction. According to the receiving body and the range of frequencies chosen, the directing characteristics will show, apart from the principal maximum, more or less intense side maxima which may increase to the magnitude of the principal maximum. This will often cause great difficulties in sounding, especially the clearness is impaired by the side maxima and may even be lost if the side maxima reach the magnitude of the principal maximum.

Furthermore, if there are several oscillations of different intensities and arriving from different directions, it will easily occur that the principal maximum of the weak oscillations is hidden by the side maxima of the intense oscillations or it will be impossible to distinguish it.

It is known to depress the side maxima in a group of transmitters by the reduction of the absolute amounts of the currents in the single transmitters from the centre towards the ends of the base. In this case, however, the distance of the single transmitters was made greater than one half of the wave length. This is connected with the disadvantage that the dimensions will often be undesirably large, or that it will not be possible, with given spatial conditions, to obtain the necessary receiving or transmitting energy. Moreover, it is known to adjust the amplification of the individual received currents in a rectilinear group of receivers acting upon a common indicator so as to be so different that the degree of amplification will increase from the ends towards the centre of the base. But this method is only applicable in cases where the base is composed of single oscillators with separate electric current conductors, as only in such cases a differing adjustment of the degree of amplification along the base may be obtained.

Another disadvantage of the known devices or methods serving to depress the side maxima consists in the fact that they were only applicable to groups of single oscillators and that no instructions were given as to how the most favourable graduation of the oscillation amplitudes might be obtained or according to what rule this graduation should be effected.

In contradistinction to these known devices, the nature of the present invention consists in the fact that the base is charged continuously or quasi-continuously, and that the unequal amplitudes of the individual elements of the length of the base are produced by unequal conversions of the waves, arriving with equal amplitudes at all elements of the length of the base, into electric oscillations, or by unequal conversions of the electric energizing currents, arriving with equal amplitudes at all elements of the length of the base, into radiating oscillation energy. The most favourable graduation of the effectiveness of the base is obtained by forming the graduation according to a numerical proportion, which is found when several continuous bases are shifted with respect to each other by such an amount that the factor introduced in the directing characteristic by this shifting will be zero at the place where, without this factor, there would be a maximum in the directing characteristic.

The different intensities in the conversion of the energy along the base may be obtained in various manners. For example, in magneto-stricture oscillators for sound production, these different intensities are obtained by using, at different parts of the base, metal plates of different thickness for the construction of the oscillator or by providing different numbers of turns in the winding of the oscillator. The desired distribution of the sensitivity may also be effected by unequally distributing the material of the oscillator along the base. This method may likewise be applied to piezo-electric oscillators. In the case of magneto-stricture oscillators, the unequal distribution may be obtained by gaps or by inserting intermediate layers between the individual lamellas.

As has been found by calculations and experiments with continuous transmitting or receiving surfaces, a considerable improvement of the directing characteristic may be obtained by subdividing the base into a few sections only, in which the intensity of the conversion of energy remains uniform, whereas it varies in steps from one section to another. However, it is necessary to correctly dimension the lengths of the sections and the proportion of the intensity with which they partake in the conversion of energy. Therefore, the correct graduation represents an important part of the invention. A subdivision into three sections, viz. two end portions, each equal to about one quarter

of the total length of the base, and a middle portion, equal to half the length of the base, will already be sufficient to make the most disturbing first side maximum vanish completely, if the two end sections of the base are operating with half the efficiency of the central section.

It is also possible to render harmless the zero points and the side maxima by an unsymmetrical distribution of the amplitude of oscillation over the length of the base, so as to decrease from the centre of the base towards one end only, but to increase towards the other end. Though, in this manner, the amplitude of oscillation will not be reduced in any transmitting or receiving direction, it will be possible to depress to any desired extent pronounced zero points and side maxima at any intensity of the principal maximum.

Several constructional examples of the subject of the invention are illustrated diagrammatically in the accompanying drawing, in which:

Fig. 1 shows a continuously charged base with a uniform effectiveness over the entire length of the base, as well as its directing characteristic in cartesian coordinates;

Figs. 2 to 4 each show a base with unequal effectivenesses over its length, as well as a diagram of the effectiveness, and the respective directing characteristic;

Figs. 5 to 9 show two magneto-structure oscillators in front and side views according to the directing characteristic of Fig. 4, the windings of the oscillator being merely indicated in Figs. 7 and 9;

Figs. 10 and 11 are diagrammatical illustrations of two or three combined semicircular bases;

Figs. 12 and 13 show the base and the directing characteristic as in Fig. 1, the directing characteristic being, however, shown in polar coordinates;

Figs. 14 to 17 show two unsymmetrical bases and the respective directing characteristics in polar coordinates; and

Figs. 18 to 21 show further constructional examples of the base.

The directing characteristic R of an oscillator according to Fig. 1, representing the course of the received or transmitted amplitudes in dependence of the direction, is obtained with a continuously charged base, the entire length of which has a uniform effectiveness w of the sound conversion of, for example, 41 cm. length at 22 kHz or 6.6 cm. wave length in water. As will be seen from the drawing, there are on both sides of the principal maximum **1** several side maxima **2**, **3**, **4**, **5**, **6**, whose amplitudes decrease with increasing distance of the direction from that of the principal maximum. The first side maximum **2** still amounts to about 22% of the principal maximum.

The directing characteristic of the oscillator according to Fig. 1 may be represented by the equation

$$R=\frac{\sin\left(\frac{\pi d}{\lambda}\sin\gamma\right)}{\frac{\pi d}{\lambda}\sin\gamma}$$

where d is the length of the straight base, λ the wave length employed, and γ the deviation of the direction from the direction of the principal maximum ($\gamma=0$).

Imagining two continuous bases **7**, **8**, each of d cm. length, as diagrammatically illustrated in Fig. 2, combined into one base by longitudinal shifting them with respect to each other by the amount of δ, the directing characteristic of this arrangement will be

$$R=\frac{\sin\left(\frac{\pi d}{\lambda}\sin\gamma\right)}{\frac{\pi d}{\lambda}\sin\gamma}\cdot\cos\left(\frac{\pi\delta}{\lambda}\sin\gamma\right)$$

If, to abridge,

$$\frac{\pi d}{\lambda}\sin\gamma=\phi$$

then

$$R=\frac{\sin\phi}{\phi}\cdot\cos\frac{\delta}{d}\phi$$

The factor

$$\frac{\sin\phi}{\phi}$$

has its zero positions at $\varphi=\pi, 2\pi, 3\pi \ldots$, its first side maximum at $\varphi_1=4.494$ (somewhat before $3\pi/2$), amounting to 0.22, and the further maxima closely before $5\pi/2$, $7\pi/2$, . . . with decreasing amounts. If δ is chosen so that

$$\frac{\delta}{d}\phi_1=\frac{\pi}{2}$$

that is, if

$$\delta=\frac{\pi\cdot d}{2\cdot 4.494}=0.35d$$

then

$$\cos\frac{\delta\phi_1}{d}=0$$

and therefore $R=0$, that is, the first side maximum of

$$\frac{\sin\phi}{\phi}$$

is divided into two considerably smaller ones **10**, **11** amounting to 0.04. Similarly it is with the fourth, seventh, . . . maximum, whereas the two maxima, always being between, will be weakened but little.

In practice, the base, diagrammatically illustrated in Fig. 2, may be formed in various manners. In the first place, it is possible, as shown in Fig. 2, to connect two continuous bases with a uniform effectiveness over the entire length d, the centres being shifted with respect to each other by the amount of δ. But with the same result, a uniform base of the length of $(d+\delta)$ and a likewise uniform base of the length of $(d-\delta)$ may be arranged and connected with equal centres. Moreover, it is possible, instead of combining two separate bases with uniform effectivenesses, to form the base at once as a unit with a correspondingly variable effectiveness of the sound conversion over its length. The variable effectiveness of the sound conversion may not only be effected by a graded widening of the base, but also by other means, for example in magneto-stricture oscillators, by using correspondingly thinner metal plates in the centre than at the ends, thus distributing the losses over the base in the unequal manner provided by the invention. It is also possible to let the turns increase towards the centre of the base in the effective proportion, or to unequally distribute the effective oscillating material over the base, for example by providing gaps or ineffective intermediate layers at the places where the extent of the sound conversion is to be reduced. A variation of the cross section over the length of the base with uniform width may be obtained by composing the oscillator of lamellas of different

or variable areas arranged so as to leave openings, or to provide interruptions at the edge.

If only two steps are provided, as in Fig. 2, it is of course also possible to effectively suppress any other side maximum if the amount of δ is chosen accordingly. In order to be able to simultaneously suppress several side maxima, it is necessary to provide more than two steps in the graduation of the effectiveness.

Three steps **12**, **13**, **14**, as shown in Fig. 3, will give a directing characteristic of

$$R=\frac{\sin\phi}{\phi}\cdot\frac{\sin 3\frac{\delta}{d}\phi}{3\sin\left(\frac{\delta\phi}{d}\right)}$$

By making $\delta=0.23d$ (about $\frac{2}{9}d$), the three first side maxima will be pressed down from

$$\frac{\sin\phi}{\phi}$$

to the amount of 0.04, as will be seen from the directing characteristic in Fig. 3, whereas the fourth side maximum will retain its amount of 0.08.

Finally, Fig. 4 shows the diagram of a base with four steps **15**, **16**, **17**, **18**, which is obtained by combining two bases, strengthened in the centres according to Fig. 2, with a distance of

$$\delta=\frac{d}{5}$$

between the centres. In a further repetition of the method, the new distance between the centres would have to be made $d/7$, resulting in a directing characteristic of

$$R=\frac{\sin\phi}{\phi}\cdot\cos 0.35\,\phi.\cos\frac{1}{5}\phi.\cos\frac{1}{7}\phi$$

By progressively arranging additional steps in the graduation of the effectiveness, the side maxima remaining in each case may be further divided and weakened. The increase in the graduation of the effectiveness from the ends towards the centre of the base will then approach a continual curve. The steps required in the graduation for suppressing the side maxima may also be ascertained by a different mathematical or experimental method, for example by arranging two or more bases of different lengths or also of different effectivenesses so as to have equal centres and by choosing the numerical proportions so that the first or any others of the disturbing side maxima will be suppressed.

Thus, for example, as illustrated in Fig. 18, there may be combined two bases with trapezoidal distribution of the amplitudes, the length proportions of the base lines and the distance between the trapezoids being determined so that the distribution of the amplitudes given by the edge line A, E, F, G, H, I, K, B will lead to the most effective weakening of the side maxima.

It is also possible, as shown in Fig. 19, that bases with triangular distribution of amplitudes, shifted with respect to each other, with equal distances between the centres, are superposed so as to form one total base, whose distribution of amplitudes is determined by the line A, E, F, G, D. An increase in the number of triangles with simultaneously decreasing distances between the centres will lead to the continual distribution of amplitudes according to the line A, E, F, G, D of Fig. 20, which is composed of three parabolic curves (parabolas of the second degree). By applying to this form the same method as for the triangles, a distribution of amplitudes A, E, W, F, W, G, D, as shown in Fig. 21, is obtained which is composed of parabolas of the third degree.

By successively proceeding in this manner, which may be continued as desired, the side maxima will decrease in geometrical progression and may be depressed below any amount. In the distribution of amplitudes according to Fig. 21, the greatest of the remaining side maxima only amounts to ½% of the principal maximum.

For practical use, the first form of construction (Fig. 2), in which the ends of the base operate over one quarter of the total length, with half the effectiveness of the centre, will give rather good results, and the graduation in four steps will already result in a characteristic practically free from side maxima. Owing to the smaller difference in the effectiveness, these arrangements are particularly easy to realize in technical construction.

Figs. 5 to 7 show a magneto-stricture oscillator with graduation in the width in order to obtain a directing characteristic according to Fig. 4.

A particularly simple method of grading the effectiveness of the sound conversion in the manner prescribed by the invention consists in covering the effective transmitting or receiving surface of the normally constructed oscillating body, for example, with crepe rubber and thereby preventing it from converting the sound.

As indicated by dot and dash lines in Fig. 5, the oscillator itself may then be of uniform width and may assume the characteristic of an oscillator with a graduation in four steps, for example, by sticking on pieces of crepe rubber in the shape of the pieces **19**. Such a method may also be easily carried out afterwards in ready installations. If, in this case, the covered portions of the oscillator, owing to coupling, should still be partly engaged in converting the sound, this may be prevented by correspondingly enlarging the pieces **19**.

Figs. 8 and 9 show a magneto-stricture oscillator, in which the steps in the graduation of the effectiveness are produced by the type of the winding **20**, in varying the number of turns in the individual sections.

The invention may also be applied to not rectilinear bases, although the suppression of the side maxima will then generally not be obtained equally well in all directions, if the curvature should entirely or partly coincide with the sounding plane or with the plane of the directing characteristic.

In particular, there may be combined a number of continuously or quasi-continuously charged circular lines in the same plane, in which case the distance between the centres may be chosen so that, for plane E, which is perpendicular to the circular surfaces, the directing characteristic will be nearly free from the side maxima. In the case of two circles **21**, **22** with the radius r and the distance δ between the centres (Fig. 10), the directing characteristic in the plane E will be

$$R=J_0(\phi).\cos\left(\frac{\delta}{2r}\phi\right)$$

where J_0 is the Bessel function, and where, to abridge,

$$\frac{2\pi r}{\lambda}\sin\gamma=\phi$$

$J_0(\varphi)$ will reach its first side maximum amount-

ing to 0.4 of the principal maximum at $\varphi_1=3.83$. This side maximum is divided by the factor

$$\cos\left(\frac{\delta}{2r}\phi\right)$$

into two maxima amounting to about 0.1, when making

$$\frac{\delta}{2r}\phi_1=\frac{\pi}{2} \text{ or } \delta=0.82r.$$

The second side maximum amounting to 0.3 at $\varphi=7$ will be but slightly weakened. In order to suppress this also, two pairs of circles with a distance between the centres amounting to

$$\delta=\frac{\pi\cdot 2r}{\pi\cdot 2.7}=0.45r$$

may be combined, the directing characteristic being

$$R=J_0(\phi).\cos(0.41\phi).\cos(0.225\phi)$$

It is also possible to at once combine three equal circles **23, 24, 25** (Fig. 11) having the distance δ between the centres, in which case there will result for the plane E a directing characteristic of

$$R=J_0\left(\frac{2\pi}{\lambda}\sin\gamma\right)\cdot\frac{\sin\left(\frac{3\pi\delta}{2}\sin\gamma\right)}{3\sin\left(\frac{\pi\delta}{\lambda}\sin\gamma\right)}=J_0(\phi)\frac{\sin\left(\frac{3\delta}{2r}\phi\right)}{3\sin\left(\frac{\delta}{2r}\phi\right)}$$

If

$$\frac{3\delta}{2r}\cdot 3.83=\pi \text{ or } \delta=\frac{\pi\cdot 2r}{3\cdot 3.83}=0.55r$$

then

$$R(\phi_1)=0$$

and generally

$$R=J_0(\phi)\frac{\sin 0.82\phi}{3\sin 0.27\phi}$$

Thereby the sound side maximum is pressed down from 0.3 to about 0.05.

The resulting characteristics are quite similar to those illustrated in Figs. 1 to 4 for straight bases.

The same effects are obtained if semicircles are substituted for the circles and if the characteristic is taken in the plane E (Fig. 10). In this case, those group listening installations are approached, in which the receivers are arranged in semicircular arcs on the ship's wall. Therefore, the side maxima are overcome by arranging, for example, three arcs, instead of one, with a distance between the centres amounting to $0.55r$ according to the above calculation, or, which is easier in technical construction, by using one arc **26** graded in such a manner that, in the horizontal projection, the same distribution of the effectiveness will be obtained as in the case of several arcs. The arcs being, in practice, about semicircular and lying approximately in a plane inclined at, for example less than 60° with respect to the horizontal plane of observation, it will be possible to approximately obtain the calculated effect for the ideal case.

The directing characteristic illustrated in Fig. 13 is based upon an oscillator according to Fig. 12, whose transmitting or receiving surface is shaped like an rectangle having a length of $l=3\lambda$, where λ indicates the employed wave length of the sound or of any other wave energy to be transmitted. The directing characteristic shows one principal maximum, every two side maxima having a pronounced zero point between them. It is mathematically represented by the equation

$$R=f(\phi)=\frac{\sin\phi}{\phi}$$

where

$$\phi=\frac{\pi.l}{\lambda}\cdot\sin\gamma$$

and γ is the angular deviation from the principal maximum.

Fig. 15 shows the directing characteristic of an unsymmetrical oscillator arrangement, in a first form of construction shown in Fig. 14. The transmitting surface is constructed so that its width from one end to the other decreases from the amount of a to the amount of $a/2$. As will be seen by comparing this with the directing characteristic of the uniform oscillator arrangement according to Fig. 1, the side maxima have the same magnitude and position as in the case of an equally long base with uniform amplitude or with uniform width of the oscillator surface. But the minima are the flatter and the nearer to the side maxima, the more the width of the oscillator surface decreases from one end to the other.

If the width of the oscillator surface decreases to zero, as illustrated in Fig. 16, then the minima will combine, as in Fig. 17, with the side maxima to form terrace points. Therefore, it is possible to more or less remove the zero points and still to reach any required sounding accuracy by a corresponding length of the base. In the limit case, there are no side maxima and no zero points or minima at all. The directing characteristic decreases monotonically from the principal maximum with any sounding accuracy.

The directing characteristics according to Figs. 15 and 17 are mathematically represented by the equations

$$R=\sqrt{f_{(\phi)}{}^2+\left(\frac{1}{3}f^1{}_{(\phi)}\right)^2}$$

or

$$R=\sqrt{f_{(\phi)}{}^2+f^1{}_{(\phi)}{}^2}$$

Of course, the invention is not restricted to the examples illustrated, various modifications and other forms of construction being possible. Especially there may be used piezo-electric instead of magneto-stricture oscillators or simple electromagnetic oscillators. The numerical values given for the grading of the base also need not be accurately adhered to, although they will afford the most effective suppression of the side maxima. The steps in the graduation may more or less continually merge into one another.

While the above mathematical calculation assumes a base with a continuous transmitting or receiving surface, the practical results may also be obtained with a quasi-continuous base, viz. with a base composed of single oscillators in a sufficient number and of an adequate density with respect to the wave length employed. In this case, the group will advantageously be constructed so that the most favourable grading calculated for the continuous charging of the base may be carried out as approximately as possible. In the simplest case, viz. in the arrangement with two steps, there will be provided according to the invention 8, 12, 16, etc. oscillators. In the arrangement with three steps, it is preferably to provide at least 13 oscillators.

The advantages of the invention are not only obtained when using one single frequency, but

also for all frequencies at the same time, which is important in acoustical sounding, as long as the quasi-continuous charging exists with respect to all wave lengths employed. The invention is of special importance when using objective indicating methods, because in this case the side maxima will be more disturbing than when listening with the ear.

The invention may not only be applied to the transmission of acoustical energy, but also to other kinds of wave energy, for example to directed electromagnetic or optical radiation. For example in optics, instead of employing the usual slots with sharp edges, the brightness may be graded from the centre of the slot towards the edge so as to suppress the secondary spectra.

In the case of bases having a pronounced directing effect in different planes, the grading may be similarly effected in different directions, for example in case of a base with a circular surface in all directions from the periphery towards the centre.

The grading of continuous or quasi-continuous bases according to the invention may also be obtained, if the electric system of the base consists of electric circuits, separate for each section and closed in themselves, provided with a resistance and with adjustable taps. Preferably, the resistances and the taps will be constructed so as to form a unit with the base, that is, they will be accommodated in the housing of the base and will be connected in the common electric circuit. In applying the invention to a group, the grading may also be obtained by regulating the electric current supply of the single oscillators.

In order to prevent the individual sections of a continuously charged base from being influenced to an undesired extent by coupling, there may be produced a mutual uncoupling of the steps by means of separating joints or the like. In the case of laminated magneto-stricture oscillators, an uncoupling may be obtained by arranging the lamellas so as to cross the longitudinal direction of the base.

There may also be provided an arrangement for selectively switching in the grading, especially if switching is required in any case, in order to pass from a smaller to a larger base. In group listening installations, the grading may be variable with the sounding angle, in order to obtain an equally or approximately equally good suppression of the side maxima in every sounding direction.

Furthermore, the unsymmetrical distribution along the base may be effected in various manners. Thus, the unequal distribution of the amplitudes may be produced by switching means (resistances, amplifiers, and the like). The group or arrangement of oscillators may have the shape of a uniformly charged surface, whose width decreases from one end to the other end of the arrangement.

The shape of the effective transmitting or receiving surface may be obtained by means of screens.

It is also not necessary to let the amplitudes decrease over the length of the base according to a linear function. Just as well the decrease may follow any other rule. The invention may also be applied to oscillator arrangements with quasi-continuous charging.

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DEVICE FOR DIRECTED TRANSMISSION OR RECEPTION OF WAVE ENERGY

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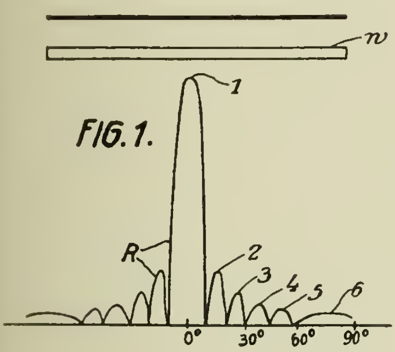

FIG. 1.

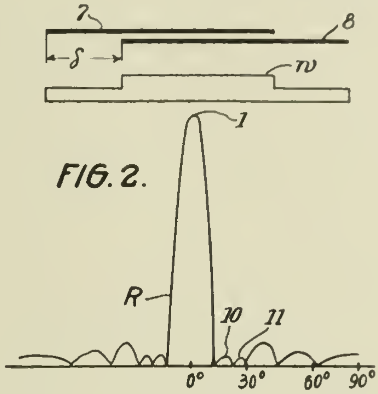

FIG. 2.

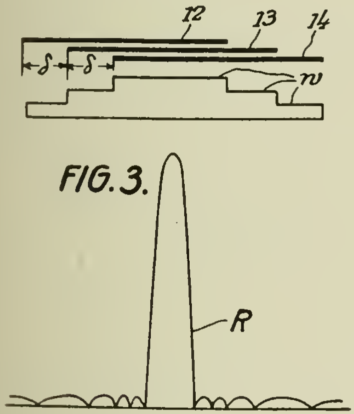

FIG. 3.

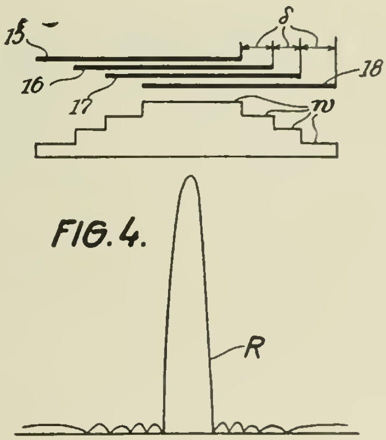

FIG. 4.

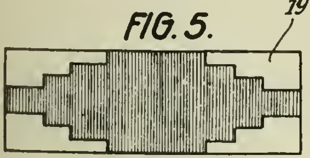

FIG. 5.

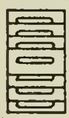

FIG. 6.

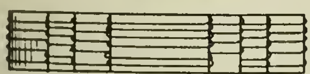

FIG. 7.

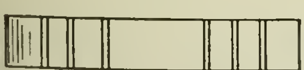

FIG. 8.

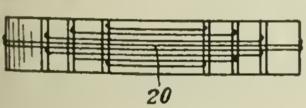

FIG. 9.

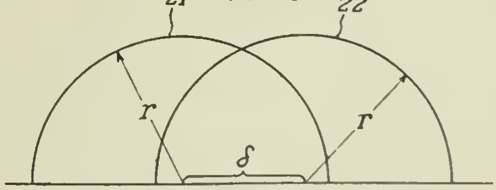

FIG. 10.

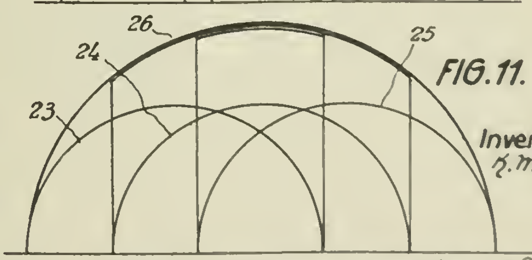

FIG. 11.

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FIG. 13.

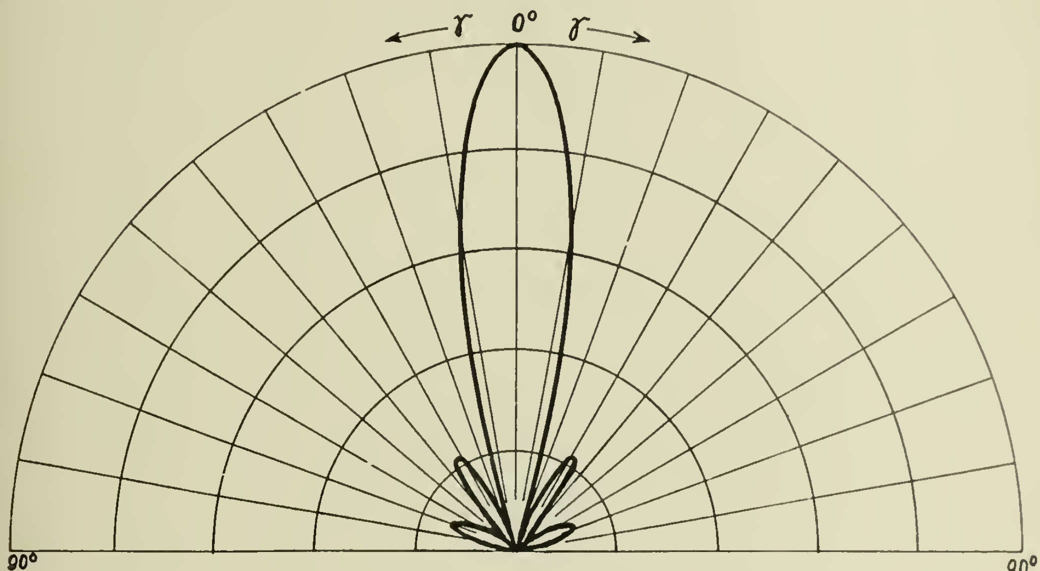

FIG. 12.

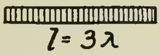

FIG. 15.

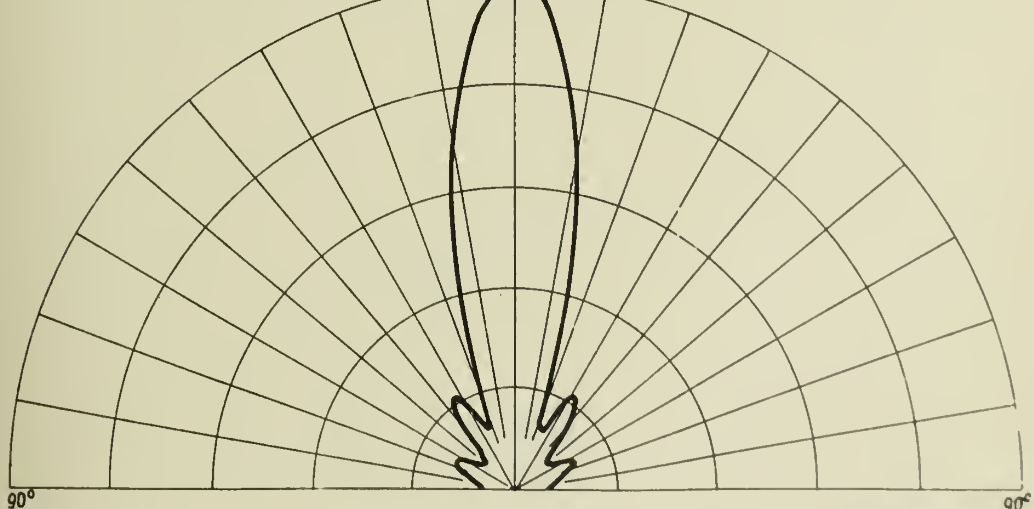

FIG. 14.

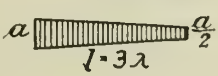

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FIG. 17.

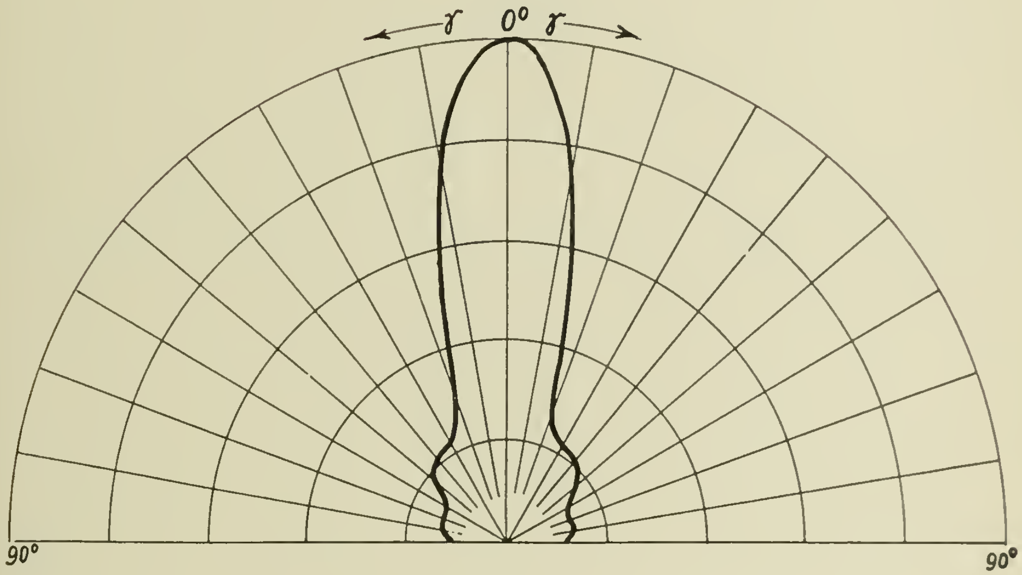

FIG. 16.

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FIG. 18.

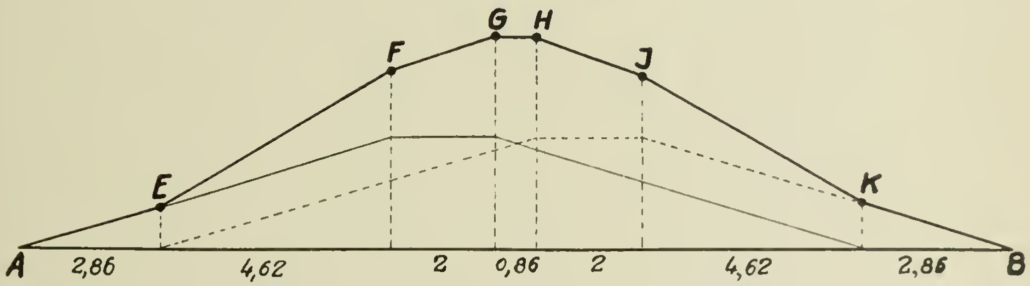

FIG. 19.

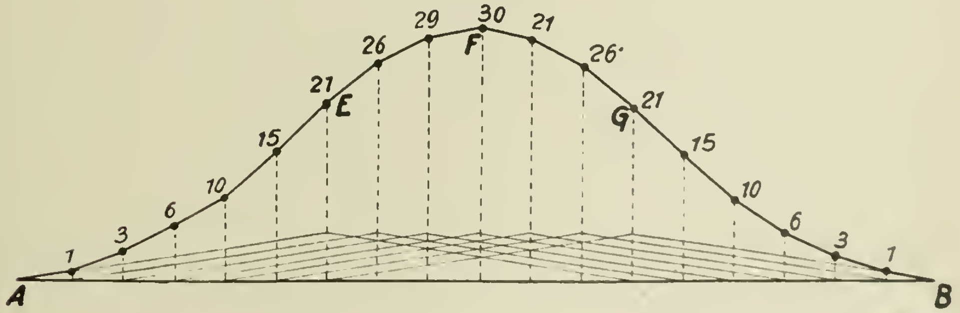

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FIG. 20.

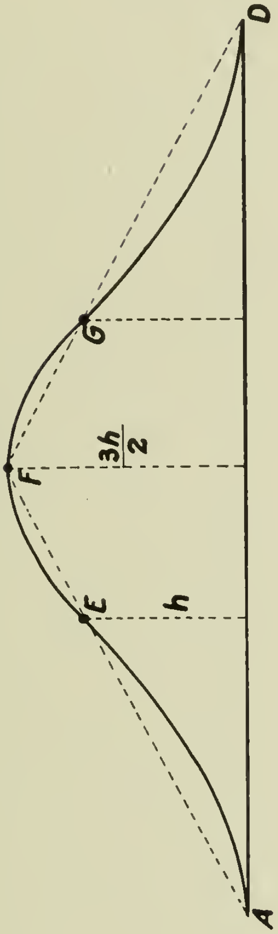
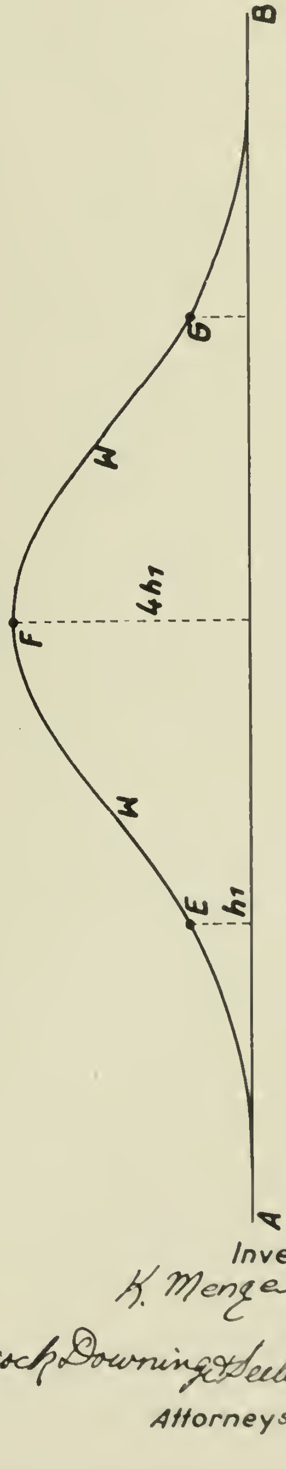


FIG. 21.



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ALIEN PROPERTY CUSTODIAN

TELEGRAPHIC RECEIVING PERFORATORS

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Application filed March 12, 1941

This invention relates to improvements in telegraphic receiving perforators.

When transmitting communications by the telegraphic method, they are frequently stored in storage tapes, particularly in perforated tapes in order to retransmit the same later on. The subscriber sets of the selector central offices are generally equipped with so-called answer-back devices which are, for instance, released by the calling subscriber with the aid of a particular impulse combination of the so-called "who are you"-combination and which then transmit the name of the subscriber. According to the service instructions the "who are you" combination is transmitted by depressing a key in general immediately after the establishment of the connection. This "who are you" combination presents under circumstances difficulties in operation when using receiving perforators and tape transmitters.

These difficulties will be hereinafter explained by reference to two instances. In Fig. 1 is provided a teleprinter network N_1 as well as a teleprinter network N_2. The teleprinter network N_1 is, for instance, a private teleprinter exchange network whose subscribers T1 and T2 may communicate with each other through an exchange office VA1. The subscribers T1 and T2 may be, for instance, central offices and branch exchangers of an undertaking of a bank or the like. The network N_2 is, for instance, a public teleprinter network. In operation it often occurs that the subscriber T1 must transmit a communication to the subscriber T3 of the public teleprinter network, i. e., to a branch exchange of a private network, which branch exchange is not a subscriber of the public teleprinter network, and that he desires to transmit a communication to any subscriber of the public network. This is accomplished in the manner that the subscriber T1 establishes a connection with the subscriber T2 and transmits his communication to a receiving perforator. The subscriber T2 dials the subscriber T3 over the public central exchange VA2 and transmits the perforated tape just received to this subscriber T3 with the aid of a tape transmitter. Consequently, if the subscriber T1 demands the name of the subscriber T2 with the aid of the "who are you" key, the "who are you" combination and immediately thereafter the identification signals transmitted from this apparatus are punched in the perforated tape of the subscriber T2. If now this perforated tape is transmitted by the tape transmitter of the subscriber T2 in the network N_2 the answer-back device of the subscriber T3 is released during the transmission of signals punched in the tape, and since this transmission cannot be interrupted, there results a reciprocal mutilation of the answer-back signals sent by the subscriber T3 and of the signals sent by the subscriber T2 with the aid of a perforated tape.

Similar difficulties may arise also within a single network. In Fig. 2 is shown the normal lay-out of a teleprinter-connection. The subscriber T1 is connected with the subscriber T2 through the connecting line L1, the preselector VW, the group selector GW, the final selector LW, a connecting line L2. If the subscriber T2 is engaged a storage position LP may be provided in a known manner to which the connection may be changed over automatically. This storage position may, for instance, have a receiving perforator to which the subscriber T1 transmits the communication. Also in this case the who are you combination punched in the tape would cause when sending the perforated tape to the subscriber T2 the release of the answer-back device of the subscriber T2 and thereby cause the same mutilations of the text as occurs in the above-described instance.

The receiving perforator according to the invention removes the drawbacks by automatically suppressing or rendering ineffective the perforation of the who are you combination.

Under the assumption of a standardized teleprinter alphabet code and of the usual teleprinter exchange traffic the who are you combination may be rendered ineffective in a simple manner by suppressing upon the reception of the who are you combination the paper feed. If each receiver and each receiving perforator as well is provided with an answer-back device, the letter shift combination-which as internationally agreed is the first combination of the answer-back signals—follows the who are you combination. As the letter shift combination in the five-unit code contains only impulse elements which correspond to perforations of a perforated tape, the letter shift signal is substituted for the who are you combination already perforated in the same row.

If in particular cases no answer-back device should be connected to the receiving perforator, the suppression of the who are you combination is caused in another manner, for instance, by suppressing the punching.

Fig. 3 shows an embodiment of a receiving perforation according to the invention in diagrammatic form.

The receiving perforator is adapted for use on a standard teleprinter receiver having selector

bars. The unperforated tape 1 is stored in a pay-out reel 2 and fed to the apparatus through guide rollers 3, 4. A roller 5 is provided for the advancement of the tape. A roller 6 biased by a spring 8 is pressed against the roller 5 with the aid of a lever 7 which is so shaped as to serve also as a guide for the paper tape. The roller 5 may be operated by a hand-operated stepping wheel, but is, as a rule, actuated in a manner to be hereinafter described through the ratchet wheel 10. The tape 1 is guided along a tape track 11. To feed the tape with one edge to the punching mechanism in an accurately uniform manner also when the width thereof varies within small limits a lateral wall 12 may be rotated about the axis 13 and is pressed against the tape by a spring 14. The punches 15 are suspended in a frame 16. They are when assembling the apparatus inserted in a gap of the frame preferably in a bore. The punches which are of the circular cross-section are flattened at the point where they are guided in the frame so that they may be moved in both directions when threaded in the frame. The flattening portion of the punches is somewhat longer in the longitudinal direction thereof than the width of the frame so that there is a certain clearance in the direction of punching movement. The frame is firmly secured to the punching hammer 20 which is guided in a bar in a manner not shown. Below the tape 1 is arranged a perforated plate in a known manner (not shown) in which the punches are inserted during the punching operation. Above the tape is provided a uniformly perforated plate (not shown) in order to prevent the punches in the upper end position from being displaced in the lateral direction. The punching hammer 20 is driven by means of a lever 21 which may be rotated about a shaft 22. The second arm of the lever 21 is designed in the form of a claw 23 and embraces an eccentric 24 secured to the axis 25. The shaft 25 end in a claw coupling 26, 27, each of the two coupling discs of which being provided with only one tooth. By throwing over the lever 28, the coupling disc 26 is brought into engagement with the coupling disc 27 under the action of the spring 29 so that the drive operates the arrangement at intervals in accordance with the arrival of the signals. In the present case in which the apparatus is designed as a perforator attachment for the teleprinter the coupling disc 26 belongs to the perforator, whereas the coupling disc 27 and the shaft 30 belong to the teleprinter proper so that the drive of the apparatus is effected by the same motor as the drive of the teleprinter proper.

The transmission of the combination values is effected by scanning the selector bars 31 of which five are provided in the teleprinter when employing the five unit code. The scanning lever 32 belongs to the perforator cooperating with the teleprinter (not shown), also five of such levers being provided in the perforator. In order to adjust the selector bar 31 the levers 32 are released by the cam 33 through the lever 34 which is supported as indicated at 35 so that they are lowered onto the selector bars 31 under the action of the spring 36 and scan the position of the selector bars 31. If the lug 33 of the lever 32 has room the bell crank lever 37 which is pivotally mounted as indicated at 38 is rotated in the clockwise direction under the action of the spring 36 and pulls at its other end the control slide 39 to the left which is pivotally connected as indicated at 40. If then the punching hammer 20 is forced or pressed in a downward direction under the influence of the eccentric 24 the punch 15 will not punch at this point a perforation.

However, if the lug 33 finds a support on the extension 41 of the selector bar 31, when the punching hammer 20 is being lowered, the lever 32 cannot follow the action of the spring 36 so that the slide 39 remains in the position shown. In this case a hole is punched upon the downward movement of the punching hammer. In order that the lever 37 follows the motion of the lever 32 also in the reverse direction of motion both levers are in engagement with each other through a member 42 of the lever 32 and a spring 43.

To advance the tape in the case of a continuous reception, the stepping pawl 44 schematically shown is employed, which is operated by the drive against the action of the spring 47 through a lever 45 and an eccentric 46. The ratchet wheel 10 is stopped in the corresponding position by a ratchet lever 48 which is under the action of the spring 49. To advance the tape by hand the control wheel 9 may be employed when inserting the tape. The lever 50 serves to move the tape in the backward direction step by step in case false signals have been perforated. It acts together with the pawl 51 on the same ratchet wheel 10 and is held in general out of engagement with the pawl wheel 10 by the spring 47. Since in the position of rest also the pawl 44 is out of engagement with the ratchet wheel 10 the tape may be moved in the reverse direction without hinderance.

To facilitate the feed of the tape the eccentric lever is provided with a third arm 52 which controls a lever 53 rotatable about the shaft 54. The lever 53 is provided at the other end thereof with a pin 55 pressed against the spring 56 which in turn carries the paper guide roller 3. Upon each movement of the eccentric 24 the lever 53 is rotated in counter-clockwise direction, thereby pressing the spring 55 in a downward direction so that the paper is tensioned by the roller 3. If then the paper is again tensioned or stretched upon reception of the next signal the lever approaches more or less the position shown, depending upon the consumption of the paper.

To enable therefore the scanning of certain impulse combinations, the lever 37 is provided with teeth 57. These teeth are cut in the same manner as is the case with selector bars; however, only for some impulse combinations. A lever having three arms 59, 60, 61 is rotated against the action of the spring 62 by an eccentric 58 mounted on the shaft 25. Upon each rotation of the eccentric 58, the arm 59 of the three-armed lever is released so that the lever is rotated in the clockwise direction under the influence of the spring 62 as soon as the teeth 57 form a slot for the arm 61. If therefore the teeth 57 are so cut that a slot is formed as soon as the who are you combination is received the lever arm 60 is moved in the downward direction so that it rotates the pawl 44 against the action of the spring 63 in the counter-clockwise direction and the pawl 44 comes out of engagement with the stepping ratchet wheel 10. When the who are you combination is utilized the ratchet wheel 10 is therefore not advanced.

In the case of the internationally standardized five-unit code, the who are you combination is allotted to the figure case and corresponds to the letter "*d*" (+−−−+−). The who are you combination is therefore transmitted always before

the transmission of the impulse combination "figure shift". Immediately after the impulse combination "who are you" follows the transmission of the answer-back impulses. It has been internationally agreed that the answer-back signals always begin with the impulse combination "letter shift". The impulse combination "letter shift" is, however, composed as follows: +++++. Since this impulse combination is perforated in the same row as the who are you combination, only the letter shift combination is perforated, because the paper tape is not advanced. The perforated tape contains therefore the impulse combinations "Figure shift", "letter shift" followed by the answer-back signals. The impulse combination who are you is suppressed.

As will be easily apparent from Fig. 3 instead of the advancement of the tape, also the punching might be suppressed; for instance, by the fact that the lever **60** acts on an intermediate member between the punch **20** and the lever arm **21**. Such a construction, which is somewhat more complicated than that according to the invention would be necessary, if the tape receiver is not associated with the answer-back device. However, such a case is seldom in practice.

The invention may, of course, also be used if the storage of the impulse combinations is not effected by perforating, but in another manner. It is, for instance, possible instead of recording holes to record impressions which are utilized by the photoelectric method.

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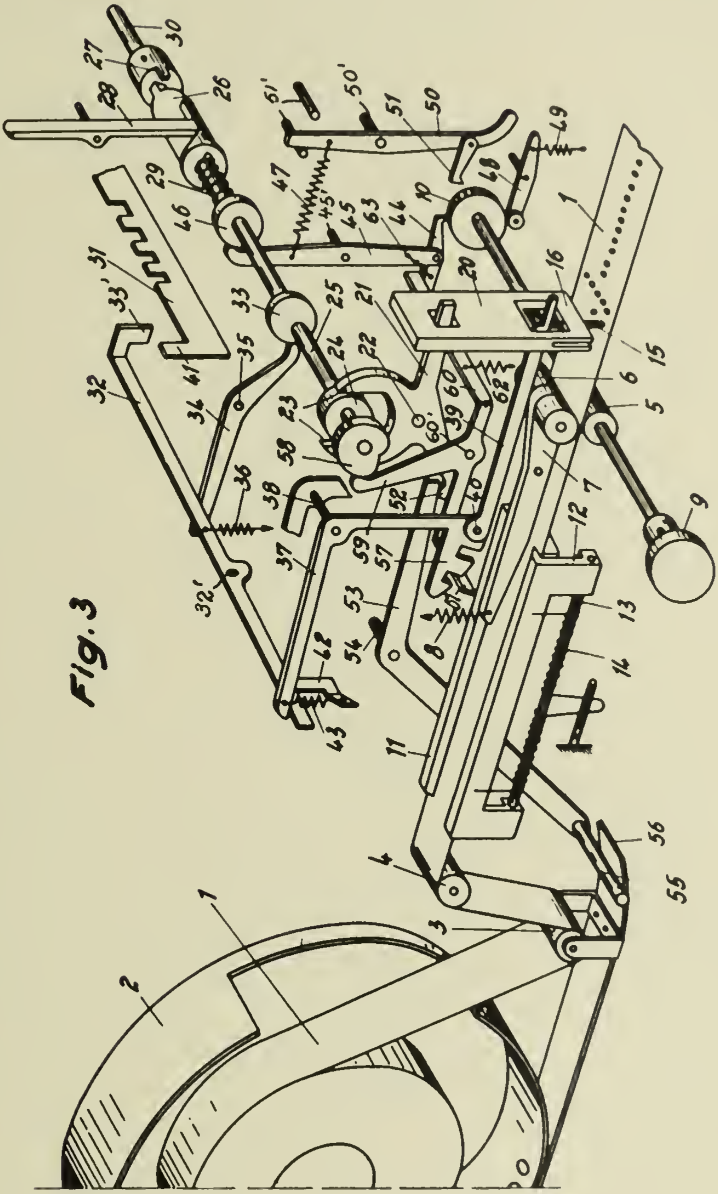

Fig. 3

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Fig. 1

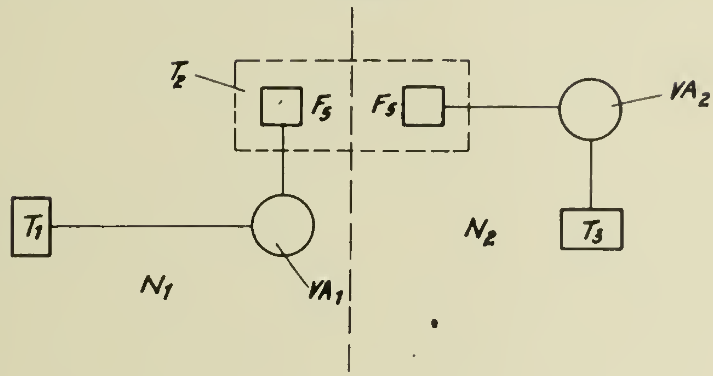
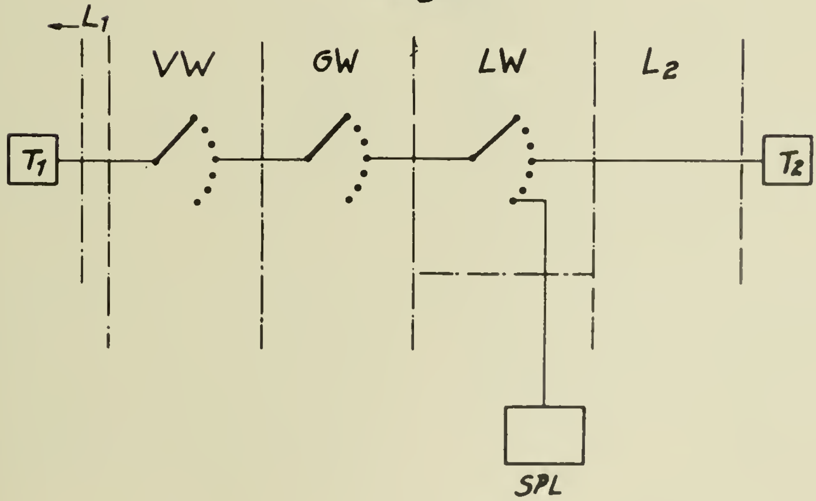


Fig. 2



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ALIEN PROPERTY CUSTODIAN

METALLIC CORROSION PROTECTION

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Magnesium and its alloys at their combination with heavy metals show a tendency to strong decomposition, especially in presence of moisture with acid- or base content.

The reason for this decomposition is an electrolytic proceeding. Magnesium has a comparatively high electric solution potential in comparison to the heavy metals, especially to iron, so that a combination of these metals in presence of acid- or base content moisture acts as an electrolytic decomposition cell.

The electrolytic solution potential ($H=-0$) amounts for: $Fe=-0.43$, $Zn=-0.76$, $Mn=-1.1$, $Al=-1.45$, $Mg=-1.87$. Between Mg and Al for instance a potential difference would therefor exist of 0.42 volt, between Mg and Mn of 0.77 volt, between Mg and Zn of 1.11 volt, between Mg and Fe of 1.44 volt. As experience has shown the little difference of 0.42 volt between Mg and Al is not prejudicial. A potential difference of less than 0.5 volt is practically harmless. Only in presence of stronger acids or bases this little potential difference may lead to slow decomposition.

The invention utilizes this knowledge and divides a high potential difference resulting for any metal combination into a row of smaller potential differences of preferably not above 0.5 volt. This subdivision takes place by interposition of one or several other metals of corresponding potential. For the combination $Fe=Mg$ which most frequently occurs in practice, for instance at the connecting of electron parts with steel parts, a three substance-metal is selected as intermediate layer according to the invention, for instance in the combination

$$Fe(Zn+Mn+Al)Mg$$

In this succession consist between the succeeding layers potential differences of 0.3; 0.34; 0.35; 0.42 volt. The claim of a potential difference of below 0.5 volt is therefore satisfied.

To carry out such a set of metals as decreasing potential set may be effected in various manners.

If for instance an electron clement has to be fixed by a steel screw, a washer of three layers, for instance Al—Mn—Zn, is sufficient for the required protection. The different layers may be produced as separate discs or as coatings on the adjacent metal, (galvanized, plated, fire metallized, squirted). The screw may be for instance galvanized, the electron part plated with pure aluminium and then only a layer of Mn may be interposed between them, or two or all three intermediate layers are plated the one on the other. The correct succession of the individual metals is material in any case.

The drawing illustrates such a multi-layer corrosion protection on a screw connection. Between the steel screw 1 and the screwed-on electron part 2, three protecting layers 3, 4, 5 are interposed in the stated succession Zn—Mn—Al.

The employment of such metal layers instead of non-metal insulating layers has the advantage of greater strength against pressing through or rubbing through.

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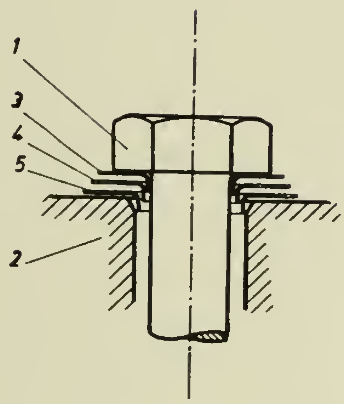

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ALIEN PROPERTY CUSTODIAN

RADIO-RECEIVER COMPRISING A MOTOR HAVING AN AXIALLY MOVABLE SHAFT FOR PERFORMING MORE THAN ONE CONTROL FUNCTION

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This invention relates to a radio-receiver comprising a motor having an axially movable shaft for performing more than one control function.

Radio receivers which can be tuned by means of push buttons may be devised in such manner that after depression of a push button the tuning means are brought into the position corresponding to the desired station by means of a motor. The use of a motor for operating the tuning means is particularly advisable when the receiver is to be tuned at a distance.

In the last-mentioned case it is advisable that additional control functions such as, for instance, the choice of the wave range, volume control, adjustment of the band-width and so on should be performed by means of a motor. For the additional functions it has already been proposed to incorporate one or more separate motors in the receiver. However, this is an expensive solution which, moreover, requires much space in the receiver.

Again it is known to use one motor for more than one control function. The receiver, for instance, may be devised so that the motor operates the tuning means in one direction of rotation and the wave-range switch in the other direction of rotation.

It has already been suggested to utilize the axial displacement of the motor-shaft for increasing the number of control functions to be fulfilled. When the motor is normally energized the shaft is shifted until the armature extends in the field. Thus a mechanical coupling with the tuning means is established. If, on the other hand the motor is energized by a weaker current the shaft is not shifted or to an insufficient degree so that the motor may actuate a potentiometer for volume control. However, this has the drawback that the motor can develop only a small torque and it is not very sure that the shaft will not shift or only to a slight extent.

To avoid these drawbacks displacement of the shaft during the performance of one control function is rendered impossible prior to putting the motor into circuit.

The invention will be more clearly understood by reference to the accompanying drawings, given by way of example.

In Figure 1 the reference number 1 denotes an electric motor whose armature 2 is mounted on a shaft 3 which is movable in an axial direction. The shaft 3 has mounted on it two pinions 4 and 5. In the position of shaft 3 illustrated in the drawing the pinion 4 meshes with a toothed wheel 6 secured on the shaft of a potentiometer 7. The potentiometer 7 serves to control the sound strength. When the shaft 3 is shifted to the right the engagement is interrupted and pinion 5 meshes with a toothed wheel 8 secured on the shaft of the diagrammatically represented tuning means 9. When the motor is not energized the shaft is kept in the represented position by a spring 10 which together with spring 11 constitutes a contact which is closed when the shaft 3 is shifted to the right. In the illustrated position the armature 2 partly extends beyond the field of the stator. Upon energization the armature is completely drawn into the field of the stator so that the coupling between toothed wheels 4 and 6 is interrupted and a coupling is established between toothed wheels 5 and 8. At the same time the spring contact 10—11 is closed. This contact is, for instance, connected in parallel with the loudspeaker of the receiver so that the loudspeaker is short-circuited during control of the tuning means.

If, however, displacement of the motor shaft 3 is made impossible prior to energization the motor on being put into circuit drives the potentiometer 7 for volume control instead of the tuning means 9.

For blocking the motor shaft there is provided a relay 12 to whose armature 13 is secured a small plate 14 which is movable along a straight guide 15. The armature 13 having secured to it plate 14 is lifted by spring 16. Upon energization of the relay 12 the plate 14 is moved in from the motor shaft so that the latter is no longer movable. Consequently the relay 12 must be energized before putting the motor 1 into circuit. To this end the relay 12 operates several spring contacts (not represented in Figure 1) by which the engagement of the motor is initiated.

Figure 2 schematically illustrates how the sound strength is controlled at a distance.

The motor 1 is fed from power mains connected between the terminals 17 and 18. In series with the motor are provided two spring contacts 19 and 20 controlled by relays 21 and 22 respectively. In the position shown in the drawing the two relays 21 and 22 are not energized and the motor circuit is interrupted. When solely the relay 21 is energized, the spring contact 19 is closed and the motor operates, for instance, in a left-hand direction. When, on the contrary solely the relay 22 or both relays 21 and 22 are energized spring contact 20 or both spring contacts 19 and 20 are operated as a result of which the motor operates in a right-hand

direction. Energization of the relays 21 and 22 is effected through the intermediary of a transformer 23 which is also fed from the power mains connected between terminals 17 and 18. This transformer serves at the same time for energization of the relay 12 which corresponds to the relay 12 shown in Figure 1. This relay 12 includes, moreover, two spring contacts 24 and 25 which are closed upon energization.

A box 26 for remote control comprises two contacts 27 and 28 for controlling the sound strength. To obtain a stronger sound solely the contact 27 is closed by means of a push-button bearing the inscription "louder", whereas for obtaining a weaker sound both contacts 27 and 28 must be closed by means of another push-button bearing the inscription "softer".

Closing of contact 27 results in that the relay 12 is energized by transformer 23. Due to this, displacement of the motor-shaft is prevented so that the motor remains coupled to the potentiometer for volume control. At the same time spring contacts 24 and 25 are closed. Now solely the relay 21 is energized through spring contact 24 so that the motor resumes its action in a left-hand direction and the sound strength is increased. When closing contact 27 and in addition contact 28 the relay 22 can also be energized through spring contact 25 as a result of which the motor resumes its action in a right-hand direction thus reducing the sound strength.

Figure 3 represents another embodiment of the invention.

The circuit shown in Figure 3 substantially corresponds to that shown in Figure 2. For simplicity the motor 1, represented in Figure 2, is omitted from Figure 3.

In Figure 3 the relay 12 shown in Figure 2 is replaced by two series-connected relays 29 and 30. Relay 29 exclusively operates both spring contacts 24 and 25, whereas relay 30 exclusively serves to prevent displacement of the motor shaft 3.

For this purpose the relay 30 is equipped with an armature 31 loosely engaging the core 32 so that the magnetic circuit of the relay 30 is closed over a very narrow air gap. The armature 31 engages the motor shaft 3.

When the relay 30 is not energized and the motor is put into circuit, for instance for operating the tuning means, the armature is pushed away by the moving motor shaft 3. When, in contradistinction thereto the relay 30 is energized, such as is the case when the motor controls the poteniometer for controlling the sound strength, the armature 31 is drawn with a great force against the core 32, since the air-gap is very narrow. The motor shaft cannot surmount this force and is consequently prevented from being displaced.

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Fig. 1

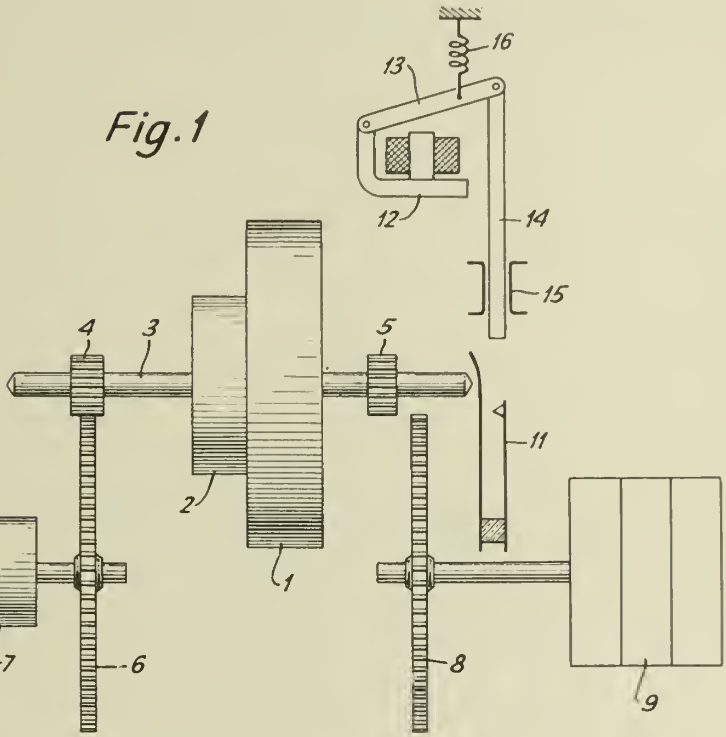

Fig. 2

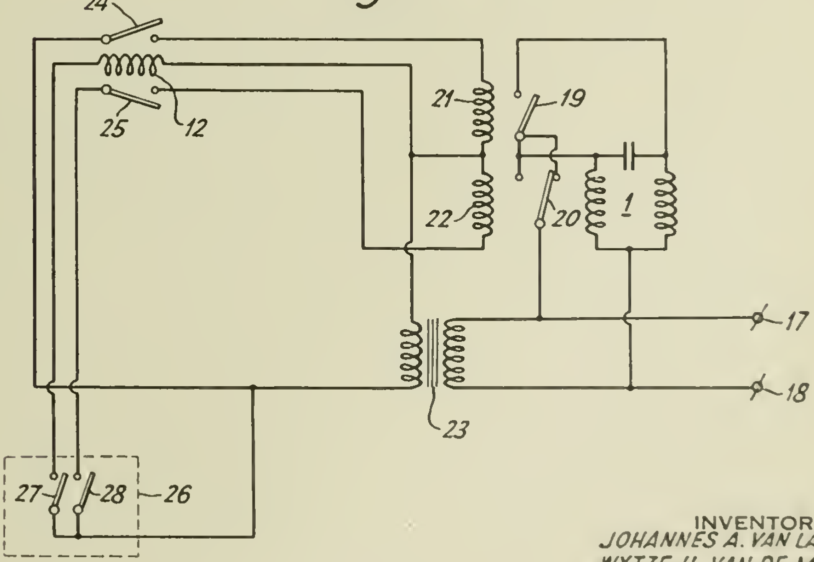

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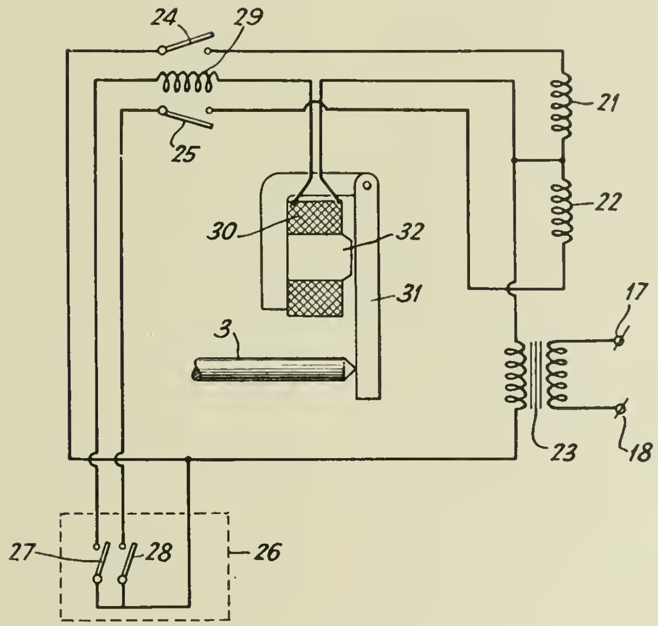
Fig. 3



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MEANS ADAPTED TO VARY THE COUPLING OF INDUCTANCES ESPECIALLY FOR RF APPARATUS

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This invention is concerned with an arrangement to vary the coupling of inductances, especially for RF work and for remote control. For a better understanding of the basic idea of the invention reference shall be made to Figure 1 of the appended drawing. In this figure are shown two inductances L1 and L2 with terminals 1, 2, and 3, 4 respectively. Each of the inductances L1 and L2 is divided into two serrated fractional windings L1′ and L1″, and L2′ and L2″, respectively. Pairs of these fractional windings L1′, L2′, and L1″, L2″, of the various inductances L1 and L2 whose inter-coupling is to be altered, are wrapped each upon a magnetizable core, preferably in the manner known from dust-cores, as indicated at 5 and 6. The circuit arrangement of the fractional windings L2′ and L2″ of inductance L2, with due regard to its sense of winding, is so chosen that the A. C. flowing through L1 will induce potentials in the fractional windings of L2 which in the series arrangement are opposed to one another. Assuming like fractional windings for both inductances and like magnetic properties for both magnetic cores 5 and 6, it follows that in the fractional windings of L2 equal and opposite potentials must be induced due to the fractional windings of L_1. These potentials therefore will cancel out in the windings of L_2 so that no potential difference will arise across the terminals 3 and 4, and this, so far as action is concerned, is tantamount to the coils L1 and L2 being decoupled or balanced out.

However, if the magnetic properties of the two magnetizable cores 5 and 6 be altered, then the voltages induced in the two fractional windings of L_2 will become different, and as a result a residual potential will arise across the terminals of L_2. Such a change in the properties of a magnetizable core may be effected, as well known in the prior art, for instance, by a bias magnetization of the core, say, by the aid of a distinct energized winding or else by means of a distinct preferably electromagnetic D. C. field exciting system between the poles of which is disposed the magnetizable core bearing the A. C. windings. If the biasing magnetization of the core is raised, its permeability governing the inductance of the winding will decrease, and vice versa. By such a change in the magnetic properties of one of the cores, however, there is evidently brought about also a change in the aggregate inductance value of L1 and L2 conjointly with a change of coupling of the two inductances. However, these effects are avoidable according to the invention, provided that the magnetic properties of both magnetizable cores are varied by regulation of the biasing magnetization to the same extent, though in opposite sense, in other words, if the permeability of core 5 is raised by the same amount that the permeability of core 6 is reduced. The inductance value of one fractional winding of one of the inductances is then raised the same amount that the inductance value of the other fractional winding of the same inductance is lowered, with the result that the aggregate inductance value of both fractional windings remains constant. This result applies to both inductances. However, notwithstanding this the difference of the potentials in the fractional windings of the second inductance rises or falls, as the case may be, in accordance with the growing or diminishing discrepancy of the permeability values of the cores, or the coupling between the two inductances increases or decreases, as the case may be.

An arrangement presenting these properties, that is to say, a variation of the coupling of two windings without any alteration of the inductance of the windings, just answers the requirements which arise, for instance, in the case of band-pass filters of variable width and which consist of two coupled tuning circuits, for it will be noted that in the said manner, in spite of a change in the coupling of the circuits, no detuning thereof will happen. For instance, in receiver sets it is possible by the application of an arrangement as here disclosed to achieve remote control for band-width variation in band-pass filters. However, this does not exhaust the utility and applicability of the invention. Arrangements predicated for their operation upon this principle may be employed also for amplitude modulation if the exciting winding controlling the coupling of the two inductances is impressed with the modulation voltage. One practical instance, for instance, is in connection with telegraphic signal work by keying of the magnetizing currents if such an arrangement is connected between the master stage and the amplifier stage of a transmitter.

A number of exemplified embodiments of an arrangement according to the invention are illustrated in Figures 2 to 4.

Referring to Figure 2, 5 and 6 denote the two magnetizable cores with the inductances according to Figure 1. Each of the two magnetizable cores 5 and 6 is disposed between the poles of a D. C. field exciting system with regulable energization, the said systems consisting of the core

7 with winding 8, and the core 9 with winding 10, to regulate the energization of the windings 8 and 10 serves a potentiometer 11 connected with the source of D. C. supply. One end of each of the two biasing magnetizing windings 8 and 10 is connected with a respective end of the resistance while both windings conjointly are associated with the adjustable slider 11*a*. If the latter is in the median position, the biasing magnetization of the two cores 5 and 6 is the same and the coupling of the two inductances L1 and L2, as hereinbefore explained, is zero or is of minimum value, while when the slider is shifted one way or the other, that is, in the direction towards the end of the resistance, the coupling of the inductances is altered. According to the direction in which the slider or tap is shifted away from the central position, there is also changed the phase position of the voltage at the second inductance governed by the coupling. Instead of the common source of voltage supply for the regulator device, it would, of course, also be possible to use distinct sources of voltage supply in conjunction with series resistances cooperating under interlocked conditions, although care must be taken in this instance so that the two sources of potential will be in agreement in a way as can be readily understood.

In the exemplified embodiment shown in Figure 3 only one magnetic iron path is used for the exciter system which comprises the two core portions 12 and 13 between the poles of which there are disposed again the magnetizable cores 5 and 6 with inductances L1 and L2 as shown in Figures 1 and 2. On the yokes of these two cores parts are disposed the respective windings 14 and 15, both of the latter being connected in series in such a way that they cause unidirectional magnetic fluxes to pass through the magnetic energizing circuit as indicated by the solid arrows. The energization of these exciting windings is insured by the potentiometer 16 and the adjustable tap 17 connected with the source of D. C. voltage supply. The legs of the two core portions 12 and 13 and the interposed cores 5 and 6 are embraced by a biasing magnetizing system in the form of winding 18. The latter sets up a constant D. C. magnetic field which has the same direction in the two legs of the magnetic energizing circuit as indicated by the dash-line arrows.

The operation of this arrangement as will thus be seen is as follows: Magnetization by the winding 18 determines a certain equal permeability value for the two cores 5 and 6 to be subjected to control action, that is, a definite operating point for the coupling 0. If, then, the regulable biasing magnetization by the windings 14 and 15 becomes increasingly more operative by the shifting of the slider 17 towards the right-hand side, the biasing magnetization of the core 5 will be raised as indicated by the arrows and as a result its permeability is reduced, whereas as regards core 6 the same situation arises, only in the opposite sense, with the result that the coupling of the two inductances is raised.

The exemplified embodiment Figure 4 utilizes a three-limb magnetizable exciter core 19. Fitted into one of the yoke pieces of the core, upon both sides of the central limb 19*a*, are the two cores 5 and 6 according to the system Figure 1. Disposed upon the central limb is an energizing winding 20 which corresponds to the two energizing windings 14 and 15, Figure 3. Upon the two outer limbs 19*b* and 19*c* are windings 21*a* and 21*b*, respectively, which correspond to the winding 18, Figure 3. The winding 20 sets up a D. C. magnetic flux the path of which is indicated by the solid arrows; the windings 21*a* and 21*b* set up a flux which is indicated by the dash-line arrows. The energization of the windings 21 is again kept constant, while that of winding 20 is regulated again with a view to changing the coupling of the inductances. In the light of these explanations in conjunction with what has been described by reference to Figure 3 the regulation of the coupling of the inductances in an arrangement as shown in Figure 4 will be readily understood.

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BY A. P. C.

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MEANS ADAPTED TO VARY THE COUPLING OF INDUCTANCES
ESPECIALLY FOR RF APPARATUS
Filed March 15, 1941

Serial No.
383,526

Fig. 1

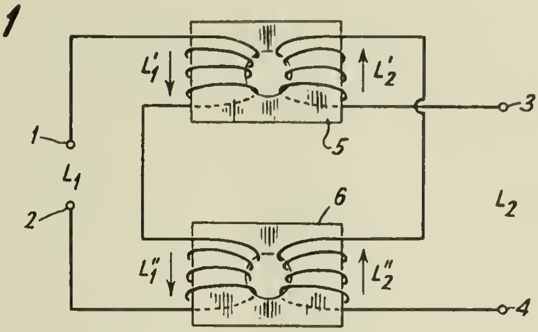


Fig. 2

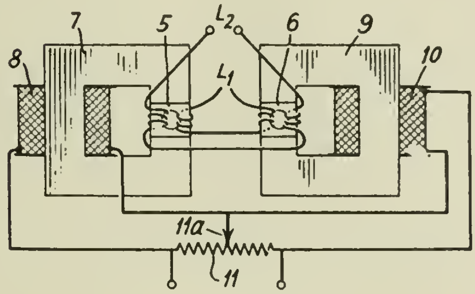
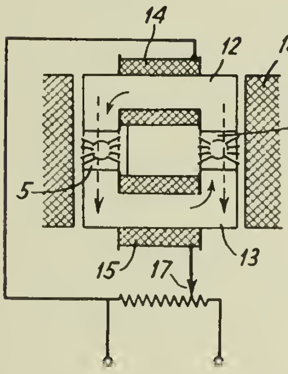
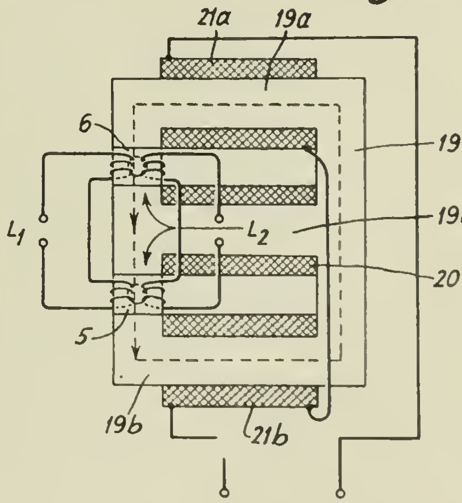


Fig. 4

Fig. 3





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Serial No. 384,019

ALIEN PROPERTY CUSTODIAN

RESONANCE DEVICE FOR ULTRA-SHORT WAVES

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Application filed March 18, 1941

In regard to a resonance system for ultra short waves it often is necessary to vary the frequency of the oscillation same being produced in the resonance system. Furthermore it is often necessary to change the frequency periodically. These arrangement specially are useful for devices for measuring distances, working according to the method of frequency wabbling. This method can act f. i. as follows: the directly received wave and the reflected wave superpose each other and the seize of the beat frequency allows to measure the distance of the reflection point. The resonance system can be a single tuned straight lined conductor or more such conductors f. i. in form of a Lecher-system. The conductors can be shielded or not. Preferably concentric Lecher-systems are used as resonance devices and especially hollow space oscillating circuits with inner conductor are used.

According to the invention the resonance devices are constructed in such manner that one or all conductors and in case of a concentric Lecher-system the inner conductor are provided with a gap. Near the gap parts of the conductor as well as parts of the inner conductor respectively are formed or profiled in such manner that in rotating same round their longitudinal axes a (periodical) variation of the capacity being formed by the gap takes place. This is happening without any longitudinal shifting.

For a fuller description of the invention reference is made to the accompanying drawings.

Figure 1 shows a concentric Lecher-system the inner conductor of which possesses a disconnection point (gap). By shifting a short circuiting device f. i. a piston the disconnection point can be shifted from the position of a potential node to a potential loop and vice versa. In Figures 2 and 4 cross sectional views of inner conductors are shown which in turning effect a periodical variation of the capacity. These variations being dependent of the angle of torsion are shown in the diagrams in Fig. 3 and 5. Figure 3 corresponds to the embodiment of the invention according to Fig. 2 whilst Fig. 5 corresponds to Fig. 4. The Figures 6 and 6*a* are showing embodiment with which a firmer coupling between the two parts of the conductor is reached. Fig. 7 shows a two-wire line being arranged in a metallic casing.

Referring to Fig. 1 a concentric Lecher-system with the outer conductor **1** and the inner conductor **2** is connected at **3** to a generator especially for ultra high frequency. At the end **4** the Lecher-system is closed by a piston **5** which has a length of $\lambda/4$ (λ=wave length) for receiving small contact resistance. (Such devices have been already explicitely described in the specifications of the Patent Application ——— Serial Number 186,454). The inner conductor of this energy line possesses a disconnection point **7**. This gap forms a series capacity of definite value. The wave length of the oscillations produced by the generator eventually can be varied by shifting the piston **5**. The energy line as shown in Fig. 1 can be used for a steady variation of the wave length f. i. with an additional hollow space as it has been already explicitely described in the former Patent 2,163,589 and Patent Application ——— Serial Number 264,246. Firstly the case is considered the capacity **7** having an infinite value. Furthermore the distribution of the voltage being as shown by the curve **8**. The capacity **7** being at a point of a potential loop it has no influence to the potential distribution nor to the wave length, also if the capacity is becoming a limited value. If in contrary the capacity **7** is shifted away from a potential loop to a current loop when of course the potential reaches a minimum f. i. in the position as shown in Figure 1, a variation of the potential- and current-distributions along the energy line takes place by changing the capacity **7**. Variations of capacity **7** are of bigger effect the nearer capacity **7** is provided to a current loop.

For using the device as per this invention of measuring distances it is advantageous to vary the wave lengths periodically and for this purpose to cause a variation of capacity **7** with a frequency of 10 to 100, f. i. 50 periods per one second without using bigger forces in the device or transmitting disturbing vibrations on same. This task can be solved by making turn part **9** of the inner conductor like a shaft by a coupled motor, f. i. about 3000 times per minute. Shaft **9** turning round, a periodical alteration of capacity **7** takes place as soon as the ends of parts **9**, **2** of the inner conductor are formed not like a plane perpendicular to the longitudinal axis but possess some form fit for its purpose.

Figure 2 shows such device of a free end of conductor **2** or **9** at the gap **7** in enlarged scale, i. e. showing the sectional elevation as well as the side elevation. In this embodiment conductor **2** over a half circle of its cross section is longer that is this forms a continuation **10** in respect to

the other half of conductor 2. Conductor 9 is formed in the same manner as before and the continuation 10 of conductors 9 and 2 are opposed each other in a tight slit, forming the field space of capacity. Turning conductor 9 and conductor 2 being unmovable, capacity 7 will be dependent of the angle of torsion φ as shown by the curve in Figure 3. At 11, there the capacity being a maximum, the two continuations 10 are placed opposite each other accurately. On the other hand at 12 the two continuations 10 of the conductors 2 and 9 are displaced opposite each other at 180° and the capacity 7 goes back to zero respectively some small value.

Wanting f. i. a sinus-shaped variation of capacity 7 the one conductor, f. i. conductor 2 can be constructed as per fig. 2 whilst the end at 7 of conductor 9 can be constructed as per fig. 4. A sinus-shaped variation can be reached in using a continuation 13 on conductor 9 forming a flat circle cross section as per fig. 4 instead of continuation 10 forming a half-circle cross-section as per fig. 2. As per theoretical calculations and considerations the limiting curve of continuation 13 must satisfy the following equation:

$$r=D\sqrt{\sin\varphi}$$

Capacity 7 varies itself dependent of the angle of torsion of shaft 9 as per fig. 5 being the analogon to fig. 3.

Constructing the variable capacity 7 in such manner as per figures 2 and 4 showing it in two different embodiments their possible maximum value is limited by the measurements of the cross sections of the conductor respectively of the cross sections of the profiled continuations 10 and 13. Thus also the degree of coupling of both parts of the conductors 2 and 9 is limited. For reaching a firmer coupling as it is necessary especially for a periodical variation of frequency both the ends of the conductors being adjacent same can be advantageously constructed as per figures 6 and 6*a*. Conductor 2 f. i. is being constructed as per fig. 2 and is being provided with a continuation 10 of half-circle-like cross-section. The adjacent part 16 of the other conductor is thicker than shaft 9 and possesses an eccentric boring 17 in which the continuation 10 of conductor 2 projects. One or both of the parts of the conductors 2 and 9 rotating round their longitudinal axis a periodical variation of capacity 7 takes place as a follow of the periodical variation of the distance of the outer surfaces of the continuation 10 from the inner surfaces of the eccentric boring. Capacity 7 is at minimum value if the plane surface 15 of continuation 10 is directed downwards. In the contrary the capacity between the front surfaces 18 and 19 will not vary and are forming a constant additional capacity.

By correct measuring of boring 17 and continuation 10 projecting into same capacity 7 can reach any wanted value. The boring 17 and the continuation 10 can obtain any other fitting form thus varying the series capacity according to a function of convenient kind, f. i. linearily or sinusshaped as per fig. 3 and 5.

Figure 7 shows a further embodiment of the scope of the invention. Instead of a concentric energy line a Lecher-system constructed by the parts 2, 9 resp. 2′, 9′ serves as resonance device and is shielded by a metallic casing 1. The parts of the conductors are disconnected at 7 and forming series capacity receiving any convenient value by proper profiling the ends of the conductors being adjacently arranged. The variation of the series capacities can be obtained by rotating f. i. the parts of the conductors 9 and 9′ round their longitudinal axis. This rotation can take place separately or commonly by coupling both the conductors 9 and 9′ over gear wheels 20 and 21 as per fig. 7. Corresponding to the choice of the gear wheels a sympathic or unsympathic variation of the series capacity takes place.

Of course such arrangements can be varied in manifold ways. The metallic casing 1 can be left off or can be substituted by another shielding f. i. by a combination of half conductors. Furthermore the Lecher-system can be tuned by a bridge member of a length of $\lambda/4$(λ=wave length), in the direction of the longitudinal axis being shiftable along the Lecher-system as is shown in fig. 1 for the case of a concentric Lecher-system. Especially by the bridge a shifting of the capacity 7 in respect to the current loops and current nodes along the Lecher-system can be obtained.

Instead of coupling the resonance device to a generator exciting oscillations the resonance device can be coupled to an energy line the tuning of which can be varied by it in a periodical way. In this manner instead of a direct frequency tuning an indirect tuning of the generator exciting the oscillations will take place. The coupling can be made in any wellknown manner it can f. i. be galvanic, inductive, capacitive or by radiator coupling. If the resonance device is shaped like a concentric pipe line as described in this specification the coupling can take place with a like energy line over a properly measured variable or unvariable slitlike opening.

If the resonance system according to fig. 1 is coupled at 3 loosely to a generator, one receive by periodical variations of capacity 7 instead of a periodical variation of wave lengths a periodical variation of the amplitude of the oscillations up to which the periodical varied and tuned resonance system is swinging. With an arrangement according to fig. 1 one can receive not only periodical variations of the wave lengths of an ultra short wave generator but also periodical variation of a coupling by firm wave length. In this manner one can f. i. produce periodical variations i. e. modulations of the energy radiated by an aerial system.

The arrangement according to the invention is effecting the periodical tuning resp. coupling of the resonance system by rotating means. By avoiding any longitudinal shifting parts of the apparatus the disturbing vibrations are completely suppressed.

Instead of periodical variations of the series capacity same can advantageously be used for changing spontaneously the frequency tuning resp. the degree of coupling from a distinct value to another distinct value. In this case the rotatable part of the conductors will not permanently rotate but being turned round a definite angle in dependance of any regulation value by hand or automatically. This rotations can be produced f. i. by a magnetical system. There a periodical variation of the series capacity will not take place but only a single or repeated alteration of its value. This alteration can be used in the same manner as the periodical variation f. i. for the frequency changing of the generator or for the alteration of tuning of one or more energy lines as well as for the changing of the degree of coupling of a generator and an energy line or the

coupling of one of themselves and a radiator or the coupling of several energy lines.

By tuning the rotating conductor part about 180° a preferable possibility of using this device is given in so far as the series capacity and thus the coupling degree are brought from their minimum value to their maximum value or vice versa. With such an arrangement a comfortable and correct morsing of aerial-systems (primary and secondary radiator) can be reached. This method has an essential advantage for ultra short waves in respect to mechanical morsing in so far as variable transition resistances at the gap and energy alterations necessarily caused hereby, can be avoided.

The use of the resonance device as per invention for varying the frequency tuning respectively the coupling degree naturally is not limited to the use in combination with generators producing ultra high frequency oscillations but can as well be used in receivers for the same purposes.

In using f. i. on part of the generator as well as on part of the receiver resonance devices of the same kind which cause a periodical variation taking place synchronically an undisturbed transmission of news can take place between two stations. Synchronising of the periodical variations of frequency is started advantageously by the generator f. i. by giving an impulse.

The influence of the variable capacity 7 to the tuning resp. coupling of the resonance system is by using this capacity in a potential loop of the most minimum value, by providing it in a current loop of the most maximum value.

By shifting their positions any intermediate values of the impression can be obtained.

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BY A. P. C.

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RESONANCE DEVICE FOR ULTRA-SHORT WAVES
Filed March 18, 1941

Serial No.
384,019
2 Sheets-Sheet 1

Fig. 1.

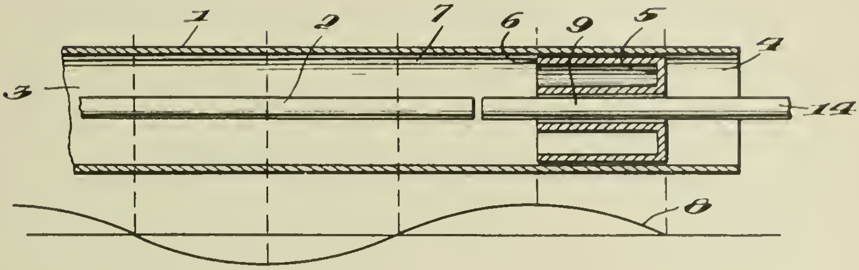


Fig. 2.

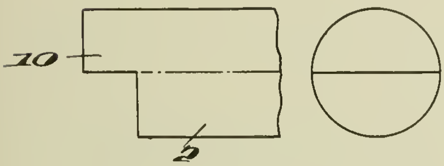


Fig. 3.

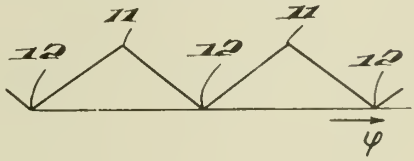


Fig. 4.

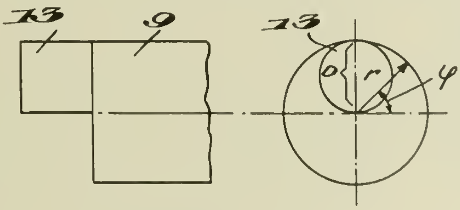
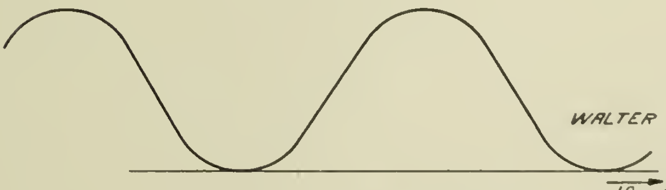


Fig. 5.



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RESONANCE DEVICE FOR ULTRA-SHORT WAVES

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Serial No. 384,019

2 Sheets-Sheet 2

Fig. 6.

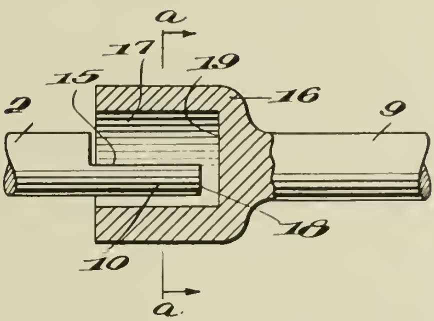


Fig. 6 (a-a)

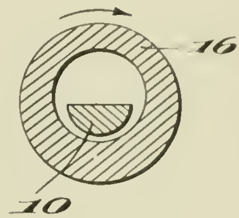
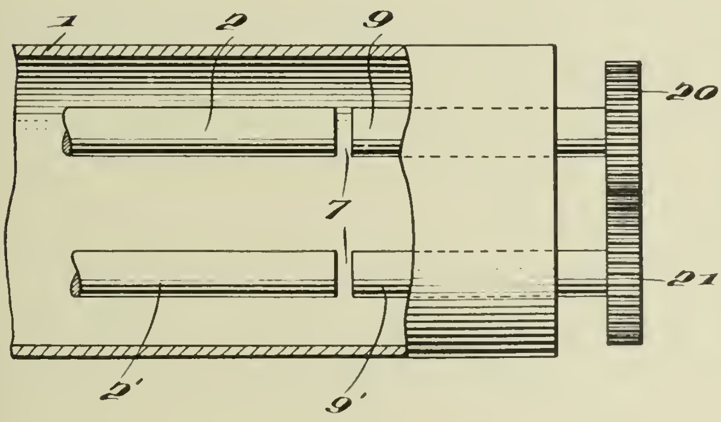


Fig. 7.



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Published May 18, 1943

Serial No. 384,740

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PRODUCTION OF HYDROCARBONS FROM CARBONACEOUS MATERIALS, ESPECIALLY BY CRACKING HYDROCARBON OILS

Gerhard Free and Wilhelm v Fuener, Ludwigshafen-on-Rhine, Germany; vested in the Alien Property Custodian

No Drawing. Application filed March 22, 1941

The present invention relates to process for the production of hydrocarbons from carbonaceous substances, in particular for the destructive hydrogenation of hydrocarbon oils.

This application is a continuation-in-part of our application Ser. No. 288,582, filed August 5, 1939.

We have found that in the production of hydrocarbons from carbonaceous substances, in particular in the destructive hydrogenation of carbonaceous materials, such as coals, tars and mineral oils, under elevated pressure, it is advantageous to use a catalyst containing silicic acid, obtained from a silica sol, and at least one compound of a polyvalent metal, in the preparation of which the sol from which the hydrogel is formed has a hydrogen ion concentration lying between pH=4 and 7, preferably between pH=4 and 6.5, during the formation of the hydrogel. Especially good catalytic actions are obtained when the sol has a pH value between 4 and 6, especially between 4.5 and 5.5. In the preparation of the catalyst, the liquid from which the gel is formed must have the said hydrogen ion concentration throughout the whole duration of the gel formation.

The catalyst may for example be prepared as follows:

A waterglass solution is converted by the addition of electrolytes into a sol with the necessary hydrogen ion concentration and then mixed with a solution of salt or with solutions of two or more salts of metals of the 2nd to the 8th groups of the periodic system. There may be mentioned for example the salts of the following metals: alkaline earth metals, aluminum, magnesium, zinc, tin, lead, titanium, molybdenum, tungsten, chromium, vanadium, iron, cobalt or nickel. If no satisfactory precipitation takes place, there may be simultaneously or subsequently added to the sol, advantageously before the completion of the gel formation, an alkaline or neutral precipitant, as for example caustic alkali solutions or sodium or ammonium acetate solutions, more preferably a solution of ammonia, ammonium carbonate or ammonium sulphide. The added substances should however be used only in such amounts that the pH value of the mixture remains between 4 and 7. The precipitant may also be added to the sol before the addition of the metal salt solution and the latter mixed for example with the water-containing gel. The mixture is then heated in order to remove the moisture wholly or for the most part. For example the mixture may be evaporated to dryness and heated for example to temperatures between 300° and 800° C.

The mixture of water-containing gel and metal compound may also be evaporated at about 100° C, filtered before drying, the residue washed for the removal of the salts causing the preparation of the gel, then dried and heated to from 300° to 800° C.

The catalyst may also be prepared by bringing the water-glass solution together with the metal salt solution without the formation of gel having first occurred. This is effected by ensuring that the mixture contains sufficient acid in excess. For example there may be added to an alkaline or acid silicate solution an acid or neutral solution of salts, as for example of aluminum and/or iron, as for example the nitrates, sulphates or chlorides of these metals, the solutions being so adjusted to each other that an excess of acid is present after mixing. It is advisable to allow the alkaline or neutral solution to flow into the acid solution. After standing for a long time the sol solidifies with the formation of the gel. The formation of the gel may be accelerated by heating the solution. The gel is then washed free from acid to a great extent and heated to high temperatures.

During washing it is advantageous to impart to the washing water at the start the same hydrogen ion concentration as that of the liquid from which the gel has been formed.

It is not essential to add the metal compound during the preparation of the silica gel, but it may also be incorporated with the finished gel, for example by impregnating the latter with a metal salt solution.

The proportion of gel in the catalyst should preferably amount to from 30 to 75 per cent. If the catalyst contains, apart from other metal components, SiO_2 and Al_2O_3, the ratio of SiO_2:Al_2O_3 should preferably be less than about 75:25.

The catalyst may also be shaped with carbonaceous substances, such as graphite, and then exposed to high temperatures, as for example from 500° to 800° C.

A small amount of boric acid, as for example from 0.2 to 10 per cent, may also be incorporated with the catalyst during its preparation, as for example before, during or after the heating.

In many cases it is also desirable to dissolve out again from the catalyst part of the introduced metal compounds, as for example with inorganic or organic acids. The dissolving out of the metal compounds may be carried out already

while the mass is still moist, i. e. before a strong heating has taken place. The resulting product is then washed out well, dried and heated.

It is especially advantageous to provide a catalyst, for example containing aluminum and/or magnesium, with one or more heavy metal compounds, in particular sulphides, as for example molybdenum sulphide, tungsten sulphide, nickel sulphide and/or iron sulphide.

The catalyst is eminently suitable for the destructive hydrogenation of coals, tars and mineral oils, extraction products of coals, cracking products of hydrocarbon oils, oils consisting mainly of hydrocarbons prepared from carbon monoxide and hydrogen, or fractions of these, substances, especially middle oils.

The destructive hydrogenation of coals, tars and mineral oils is carried out at pressures above 20 atmospheres, preferably above 250 atmospheres, as for example at from 300 to 700 or 1000 atmospheres. The catalysts to be employed above 250 atmospheres, in particular above 300 atmospheres, advantageously may only contain silica, alumina and/or magnesium but no other strong hydrogenating metal compounds, whereas metal compounds having a weak hydrogenating action, for example the oxides or sulphides of zinc or manganese, may be present. On the other hand the catalysts to be employed with pressures of from 20 to 300, more particularly from 50 to 250, atmospheres, advantageously may contain also heavy metal sulphides, especially sulphides of molybdenum, tungsten, iron, nickel and cobalt.

The following examples will further illustrate how the said invention may be carried out in practice but the invention is not restricted to these examples.

Example 1

650 grams of a waterglass solution containing 26 per cent of SiO_2 are diluted with water to 3 liters and acidified with 160 cubic centimeters of concentrated hydrochloric acid. This solution is adjusted to a pH value of from 5.5 to 6.0 by the addition of ammonia, stirred and there is then added, while continuously stirring, a solution of 680 grams of aluminum nitrate ($Al(NO_3)_3 \cdot 9H_2O$) in 2 liters of water. The acid thus set free is continuously neutralized with such an amount of ammonia that the pH of from 5.5 to 6.0 is maintained during the precipitation. The precipitate is filtered, washed first with acidified water (pH=5.5 to 6.0) and then with pure water, dried and heated to from 450° to 500° C.

The catalyst is then used in the destructive hydrogenation of a paraffin base gas oil boiling between 210° and 350° C. under a hydrogen pressure of 600 atmospheres at 410° C. with a throughput of 2 kilograms per liter of catalyst and per hour. The product obtained contains 65 per cent of gasoline with an octane number of 75.

Example 2

1.3 liters of waterglass solution containing 26 per cent of SiO_2 are diluted with 10 liters of water and 430 cubic centimeters of concentrated hydrochloric acid are added. 3.95 kilograms of aluminum nitrate ($Al(NO_3)_3 \cdot 9H_2O$), 60 grams of iron chloride ($FeCl_3 \cdot 6H_2O$) and 18 grams of magnesium nitrate ($Mg(NO_3)_2 \cdot 6H_2O$) dissolved in 10 liters of water are added to this solution. The clear sol thus prepared and a 20 per cent ammonia solution are allowed to flow while stirring vigorously into 3 liters of water which has been adjusted to the desired pH value of 5.5 by the addition of ammonia, the manner in which the sol and the ammonia solution are allowed to flow in being such that in the liquid in which the precipitate is formed the said pH value, measured with an antimony electrode, is maintained. The precipitate is filtered off, washed free from chlorine with water adjusted to a pH value of 5.5 and dried. The resulting catalyst is impregnated with ammonium thiotungstate dissolved in ammonium sulphide solution in such an amount that the finished catalyst contains 10 per cent of tungsten disulphide. The catalyst is then dried, heated at from 400° to 420° C. in a current of hydrogen and shaped.

If a mixed-basic petroleum middle oil be led over this catalyst at 410° C. and with a hydrogen pressure of 250 atmospheres, a product containing 60 per cent of benzine and having an octane number of 77 is obtained in a 90 per cent yield.

GERHARD FREE.
WILHELM v FUENER.

Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

EXTRUSION DEVICES FOR THE MANUFACTURE OF CABLE SHEATHS

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Application filed March 24, 1941

This invention relates to extrusion devices, and more particularly to an extrusion block for applying aluminum sheaths to conductors of cables.

When applying metal sheaths to the conductors of cables, especially sheaths of metals having a high fusing point, such as aluminum, the conductor of the cable is liable to become deteriorated as a result of the high extrusion temperature. This may easily happen, particularly during the short periods in which the press is not operated. To protect the conductor of a cable against high temperatures which occur when extruding metals having a high fusing point, it has already been proposed to cool the conductor of a cable with the aid of a double-walled protective cylinder through which passes the conductor of the cable, the protective cylinder being arranged in the extrusion block and traversed by a cooling agent. However, this protective cylinder has hitherto been tightly fitted in a bore provided in the extrusion block. In such an arrangement the cooling agent flowing through the hollow jacket of the protective cylinder not only exerts a cooling effect on the conductor of the cable, but at the same time cools the extrusion block so that also the difficultly fusible filling material is cooled. In this manner a satisfactory cable sheath cannot be produced.

The present invention consists in providing between the protective cylinder and the bore provided in the extrusion block and through which the protective cylinder extends a layer so as to insulate the heat. In this manner the extrusion block is prevented from being cooled by the cooling agent flowing through the protective cylinder.

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form, in which Fig. 1 is a vertical longitudinal sectional view of the extrusion block, Fig. 2 is an enlarged vertical sectional view of the extrusion block, partly broken away, Figs. 3, 4 and 5 are sectional views taken on the lines III/III of Fig. 1 and IV/IV and V/V of Fig. 2.

The extrusion block as shown in Fig. 1 serves particularly to apply an aluminum sheath to the conductor of a cable. The extrusion block **1** is threadedly engaged with the core holder **2**, to which is secured the die core **3**. Furthermore, the extrusion block **1** is threadedly engaged with the nut **4**. In the bore of the core holder **2** projects a double-walled metal protective cylinder **6**, through which passes the conductor of a cable not shown and which is provided with an inlet **7** and an outlet **8** for the cooling water. The cooling water flows through the hollow jacket **9** of the protective cylinder around the guide member **10**. The conductor of the cable is cooled by the protective cylinder **6**.

The outer jacket surface **11** of the protective cylinder is spaced from the bore **12** of the core holder **2** by an annular space **13** communicating with the outside atmosphere. A detrimental cooling of the core holder **2** and of the extrusion block **1** caused by the cooling agent flowing through the protective cylinder **6** is prevented by the air contained in the space **13**. The protective cylinder is secured in the concentric position in the bore **12** of the core holder **2** by a conical spacer **15** fixed to the protective cylinder **6** and consisting of a poor heat conducting material, such as steatite, without this spacer causing any appreciable dissipation of heat from the extrusion block to the protective cylinder.

As will be seen from Fig. 2, the protective cylinder has at its inner end a truncated conical portion **15**. The outer jacket surface of this conical portion is separated from the inner conical metal surface **16** of the core **3** by an annular space **17** which is in communication with the intermediate space **13** and which contains an air layer serving to insulate the heat. In this manner, the cooling agent flowing through the protective cylinder **6** is prevented from exerting its action on the core **3**.

The cable issuing from the die **5** and provided with an aluminum sheath is cooled by a spraying device **18**. This spraying device consists of a cylinder **19** through which passes the cable and in whose upper part is arranged a tubular section **20** so as to form a distributing chamber **21** for the cooling water. The cooling liquid flows through the inlet **22** into the chamber **21** and is squirted out through the perforations **23** to cool the cable sheath. At the outer end of the cylinder **19** is provided an inclined portion **24** for discharging the cooling water used into the collecting tank **25** (Fig. 1).

The portion of the cylinder **19** projecting into the bore **30** is surrounded by a protective cylinder **26**. Between the cylinders **19** and **26** is provided an annular space **27**. The cylinders **19** and **26** are held in the concentric position with respect to each other by means of lugs **28** provided on the cooling cylinder **19**. The outer jacket surface **29** of the protective cylinder **26** is spaced from the bore **30** of the nut **4** by an annular space **31** communicating with the outside atmos-

phere and containing an air layer serving to insulate the heat. On the protective cylinder 26 are provided conical spacers 32 consisting of steatite or any other poor heat conducting material and which maintain the protective cylinder 26 in a concentric position with respect to the bore 30.

At the left-hand end, the protective cylinder 26 is bent at right angles to form a flange 33 which has a relatively large opening 34. Between the flange 33 and the die 5 there is a space 35 communicating with the space 31 and serving to insulate the heat. An interchangeably arranged cap 36 fits very closely to the flange 33 and has an opening 37 whose diameter is slightly greater than the outer diameter of the aluminum sheath applied to the conductor of the cable. The funnel-shaped enlargement 38 provided at the outer end of the protective cylinder 26 discharges the cooling water used into the collecting tank 25.

The protective cylinder 26 (Fig. 2) protects the nut 4 against the cooling water squirted out from the sprayer device 18. The water squirted onto the aluminum sheath of the cable through the perforations 23 is collected at the bottom of the cooling cylinder 19. At the discharge end 24 the cooling water flows in part into the collecting tank 15. The other portion of the cooling water flows over the inner edge of the tube 19 to the bottom of the space 27 and is then discharged at the funnel-shaped end 38 into the tank 25. The protective cap 36 prevents the cooling water flowing over the inner edge of the cylinder 19 from being splashed onto the die 5.

In case an aluminum sheath of a greater or smaller outer diameter should be applied to the cable, the cap 36 is replaced by another cap whose bore is adapted to the smaller or greater outer diameter of the aluminum sheath.

The funnel-shaped enlargement 38 prevents a splashing of the cooling water flowing from the space 27 onto the nut 4.

WALTER HYPRATH.

PUBLISHED

MAY 18, 1943.

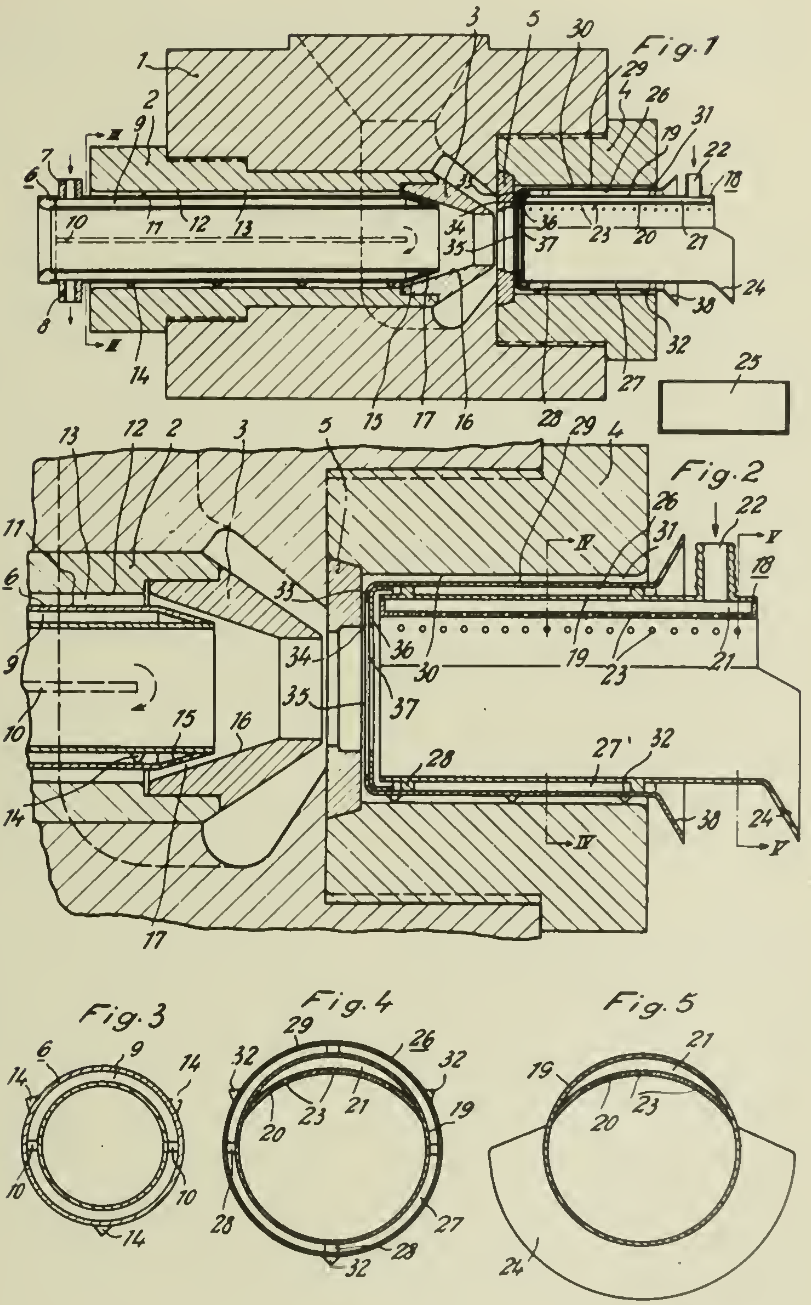
BY A. P. C.

W. HYPRATH

EXTRUSION DEVICES FOR THE MANUFACTURE OF CABLE SHEATHS

Filed March 24, 1941

Serial No. 384,913



Inventor:
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Published May 18, 1943 Serial No. 384,985

ALIEN PROPERTY CUSTODIAN

BINDING CLAMP TO HOLD A LINE WOUND ON TO A ROLL

Christian Sørensen, Understed near Saeby, Denmark; vested in the Alien Property Custodian

Application filed March 24, 1941

Such rolls are known, on to which a line is wound thereby that the roll is rotated under the action of a spiral spring, which is set under the unwinding, while the roll can be held in various positions by a ratchet which prevents the unwinding of the line by gearing with a notch. When the ratchet is in gear with the notch, the line cannot be unwound by pulling it. To release the ratchet and effect the unwinding a small piece of the line must first be wound on, after which it can again be unwound by a quick pull of the line. When the sufficient piece of line has been unwound, the line should be slowly pulled by which the ratchet will again be able to gear with the notch. If the whole length of the line is rolled on to the roll, so that a limiting part, generally a ring at the end of the line, strikes a leading eye for the line, it may happen that the ratchet simultaneously gears with the notch. As it is not possible to wind on further a small piece of line to release the ratchet from the notch owing to the ring's striking the leading eye, the line cannot be unwound.

The above mentioned drawback has been prevented by the present invention, which relates to a binding clamp to hold a line wound on to a roll. The clamp can be placed at a greater or smaller distance from the ring in question, so that, when the line is to be unwound, it is possible to get so much of the line free between the eye and the clamp that the roll can be rotated a little for the winding on of the line, whereby the ratchet can be released from the gear with the notch and the unwinding be effected as above mentioned.

The invention consists of two rails, connected by a bolt and a spring arranged round it and so arranged that one of the rails can swing slightly on the other. In one end of each of these rails is a hole through which the line is passed. The hole of one rail is not exactly over the hole of the other hole, but is displaced a short distance, so that the line can get jammed between the edges of the two holes when the clamp is closed.

The drawing shows:

Figs. 1 and 2 a roll with a binding clamp according to the invention in side-view and top-view respectively,

Fig. 3 a section on the line *a—a* in Fig. 1 and Figs. 4 and 5 a longitudinal section in the binding clamp and showing the clamp in two different positions, drawn to a larger scale.

The roll shown in the drawing, which is of known construction, consists of a rail **1**, serving to hang the roll on a wall or the like. On the rail **1** is fixed a rail **2** with a notch **3**. Round a bolt **4** of the rail is rotatably arranged a roll **5**, on which a ratchet **7** is rotatably arranged round a pivot **6**, which ratchet can gear with the notch **3** and prevent the rotation of the roll. Inside the roll **5** is arranged a spiral spring **8**, one end of which is fixed to the bolt **4**, and the other end to the roll **5**. On the roll is wound a line **9**, which has been passed through an eye of a pivot **10** on the rail **1**. In the free end of the line **9** is a ring **11** to be hung on a hook or the like, when the line is to be used for the drying of clothes. Under the unwinding of the line the spring **8** will be set and, when the line is slacked, it will rotate the roll and wind on the line. Instead of the winding-up line described other known winding-up rolls can be used.

To prevent the line from being wound on to the roll in its whole length, a binding clamp is placed on the line, which clamp can be removed to different positions.

The binding clamp consists of two rails **12** and **13** interconnected with a pivot **14**, which is fixed in the rail **13** and passes through a hole **15** of the rail **12**. Round the pivot **14** is arranged a screw spring **16**, which holds the two rails together. One end of the rail **13** is bent slightly upwards. In the other end of the rail **13** is a hole **17**, and in the rail **12** is a hole **18**. The line **9** is passed through both these holes, which are not lying just opposite each other, so that, when the clamp is closed as shown in Fig. 4, the line will get jammed between the edges of the two holes. If the end of the rail **13** is pressed slightly, so that it gets into the position in relation to the rail **12** shown in Fig. 5, the line **9** is no longer pressed, and it can therefore run freely through the holes **17** and **18**. Before the winding-up commences, the clamp can be placed at a suitable place on the line **9**, which can then only be wound on as far as to the clamp.

CHRISTIAN SØRENSEN.

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C. SØRENSEN
BINDING CLAMP TO HOLD A LINE
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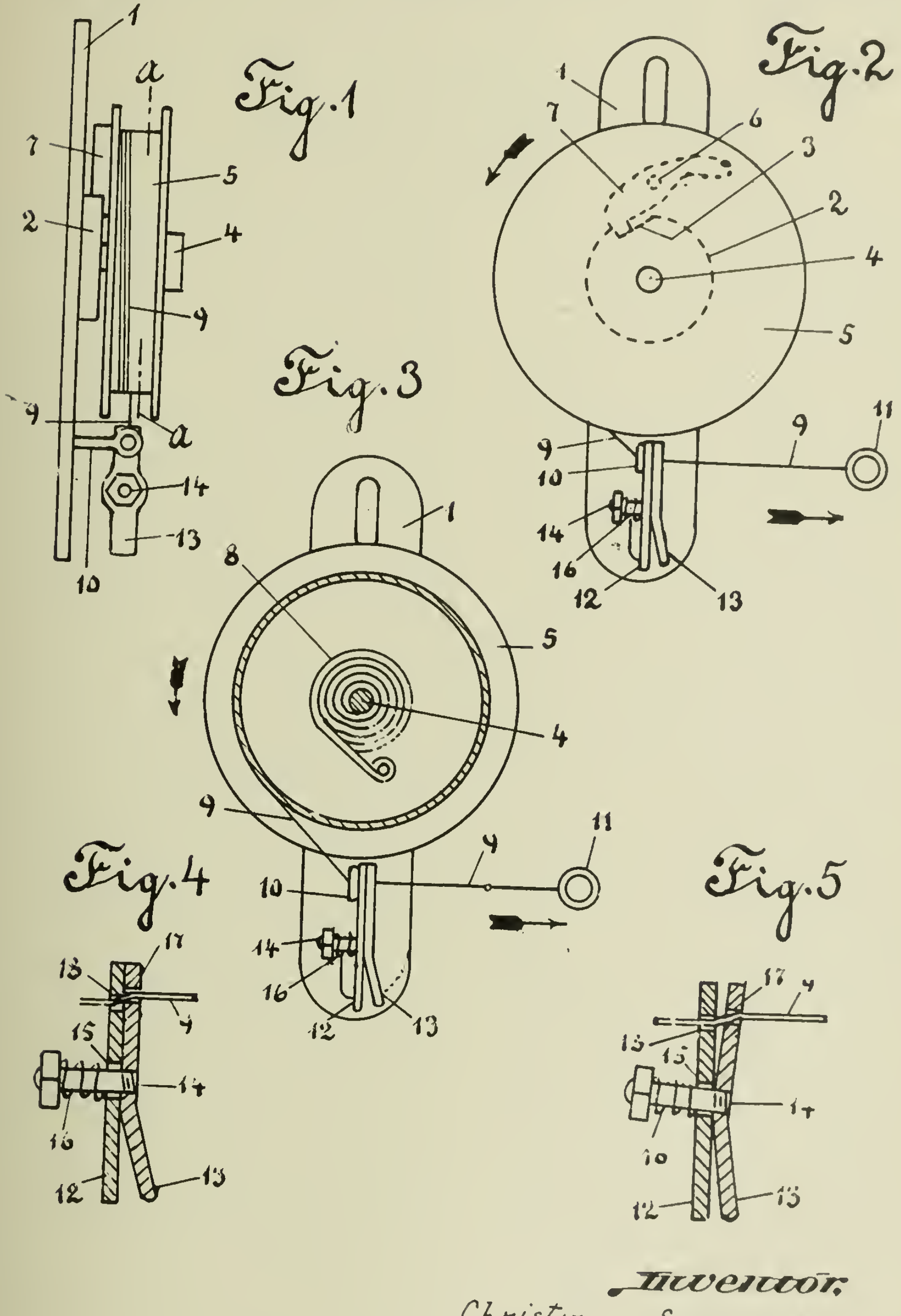
Serial No.
384,985



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Published May 18, 1943 Serial No. 385,563

ALIEN PROPERTY CUSTODIAN

SCREW PROPELLER PITCH ADJUSTING DEVICES

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Application filed March 27, 1941

This invention relates to adjustable pitch screw propellers usable on land, sea or air vehicles, or even on stands for testing engines or the like, and more particularly to a device for adjusting the pitch of rotating screw propellers having any number of blades, the arrangements that embody such a device being of course included in the scope of this invention.

More specifically, the screw propeller pitch adjusting device is of the kind comprising, on the one hand, a driving mechanism housed in a stationary casing and driving a member, such as a gear wheel or the like, coaxial with the propeller shaft and, on the other hand, driving connections between said coaxial member and the different blades for controlling the angular setting of each blade about its axis in a manner which is dependent upon the rotation of said coaxial member relative to the propeller shaft.

The mechanisms of this kind as heretofore known comprise clutches or similar devices allowing of connecting same, at will, with the screw propeller shaft which itself serves as a power source for the control of pitch adjusting, resulting in rather intricate arrangements.

On the other hand, there has already been proposed a blade pitch indicator comprising a differential gear, the two sun wheels of which are respectively connected with the propeller shaft and the aforesaid member, coaxial with this shaft, and the planet pinion of which is carried by a support or casing the angular setting of which, relatively to the common axis of the sun wheels, is determined in any suitable manner, thus allowing to read the pitch of the screw propeller upon which said angular setting is dependent.

The present invention consists, inter alia, in applying a device of the aforesaid type, used as a propeller pitch indicator, for controlling the adjusting of said pitch and in providing said device, for that purpose, with a driving shaft arranged so as to control the rotation of the support or casing of said planet pinion in either direction and which may, for example, be hand-operated, by an electric motor rotating in both directions, or the like.

There is thus obtained a simplified arrangement of reduced weight and bulk, well suitable for numerous uses.

In the arrangement thus constructed, every rotation or partial rotation impressed to the aforesaid driving shaft corresponds to a well defined alteration of the angular position of the blade, so that it is possible, in accordance with another feature of this invention, to conjugate said driving shaft with a pitch indicator comprising, for example, a pointer operated by said shaft through the medium of a reducing transmission gear.

According to a preferred embodiment, the device comprises a differential gear the planet pinion of which is carried by a casing connected with a crown wheel engaging with a driving pinion attached to a driving shaft connected by a reducing gear to a pitch indicator, while the sun wheels of said differential gear are connected with the driving shaft and the coaxial member by transmissions having the same gear ratio, of which transmissions one comprises an additional idler pinion for reversing the direction of the rotation in order to prevent the rotation of the coaxial member relatively to the driving shaft when the differential casing is not in motion.

Another feature of this invention—which is a highly desirable improvement usable independently from that described above, though it will be advantageously used in combination therewith, consists in arranging forwardly of the propeller hub, i. e. on the side of the housing for the driving mechanism that is remote from the propeller, the greater part of the transmission members that cannot be placed inside said housing, so as to reduce the overhang to a minimum value in placing the centre of gravity of the propeller as near as possible to the bearing that supports the hub of the shaft.

In accordance with the invention, the transmission between each of the blades of the propeller and the aforesaid control member, which is coaxial with the propeller shaft and carries a toothed wheel, comprises a gear secured to a secondary shaft supported parallelly to the axis of said propeller shaft in the hub of the propeller and extending throughout said hub, said gear engaging with the aforesaid toothed wheel, and a gear secured to said secondary shaft forwardly of the propeller and directly connected to a transmission carried by the hub and in engagement with the corresponding blade.

Each of the blades of the propeller are connected by similar transmissions with the aforesaid coaxial member.

Other features and advantages of this invention will be apparent from the following description of an embodiment shown merely as an example in the accompanying drawings in which:

Fig. 1 is a sectional elevation on the line I—I of Fig. 2, showing a propeller according to the invention;

Fig. 2 is a corresponding end view of said propeller;

Fig. 3 is a fragmental section on the line III—III of Fig. 1;

Fig. 4 shows a modification of a detail.

According to the embodiment shown, relating to a four-blade screw propeller, the hub **1** of said propeller, attached to the end of the propeller shaft **2**, is reduced in length substantially to the diameter of the sockets **3** of the roots **4** of the blades. Each blade root **4** is provided on its base with a spindle extension **6** mounted by means of a roller bearing **7** in the hub **1**. To this spindle **6** there is secured a gear wheel **8** (Fig. 3),

in engagement with a rack 9 provided on a screw nut 10 which coacts with a screwthread 11 formed on a secondary shaft 12. The shaft 12 is mounted parallely to the propeller shaft 2 in roll bearings 13 and 14 carried by the hub 1 and projects forwardly of the latter, i. e. on the side remote from the engine. To the projecting end of said shaft 12 is secured a crown wheel 16 having an inner set of teeth of large diameter with which engages a small pinion 17 attached to a secondary shaft 18, carried by and extending throughout the hub 1. The secondary shaft 18 carries at its rear end a gear wheel 19, in engagement with a set of teeth 20 provided on a driving sleeve 21 that is loosely mounted on the propeller shaft 2.

In the example shown, three other gearings are provided which are exactly similar to the gearing just described and bear in the drawings the same numbers of reference but with the differentiating signs ′, ″ and ‴ affixed, the four gearings thus ending respectively with four gear wheels, 19, 19′, 19″ and 19‴, engaging with the set of teeth 20 of sleeve 21.

The sleeve 21 is provided with another set of teeth 23 adjacent to which there is coaxially secured to shaft 2 a gear wheel 24 having substantially the same diameter as the set of teeth 23, both sets of teeth being arranged opposite the end of a fixed casing 25 secured to the end of the frame 27 supporting the propeller shaft 2, said casing housing the mechanism for controlling the adjustment of the blade pitch.

This mechanism comprises substantially a differential gear consisting of two coaxial sun wheels 30 and 31 and a planet pinion 32. The sun wheel 30 is attached to a shaft 33 to the end of which there is secured a gear wheel 34. Supported by the casing 25 there is a pinion 35 engaging with both gear wheels 34, 23. The sun wheel 31 is integral with a sleeve mounted on shaft 33 and carrying a gear wheel 37. Two pinions 38, 39 supported by the casing 25 are in engagement with each other and are also respectively in engagement with gear wheels 37 and 24. The whole device is arranged so that the wheels 23 and 24 rotate at the same speed and in the same direction when the sun wheels 30 and 31 rotate at the same speed but in opposite directions, i. e. when the planet pinion 32 is stationary. This planet pinion 32 is loose on a stub shaft carried by a casing 41 mounted on roll bearings provided in the casing 25 coaxially with shaft 33. This casing 41 is provided with a crown wheel 42, driven by a pinion 44 that is attached to a shaft 45 projecting from the casing 25 and to which there is secured a hand wheel 48.

The shaft 45 carries a gear wheel 50 connected by a reducing train of gears 51, 52, 53, 54 and 55 with a shaft 56 operating a propeller pitch indicating device 57.

A stop device, not shown, permits of fixedly holding the shaft 45 in any angular position desired, said device being arranged so that it may be put out of action when desired.

An electric motor 70 rotating in both directions and controlled by a reversing switch 71 may be eventually coupled with the shaft 45 through the medium of a reducing gear (Fig. 4). This motor may be automatically started, for example under control of the speed of propeller shaft 2, through the medium of a centrifugal device or the like.

The operation is as follows:

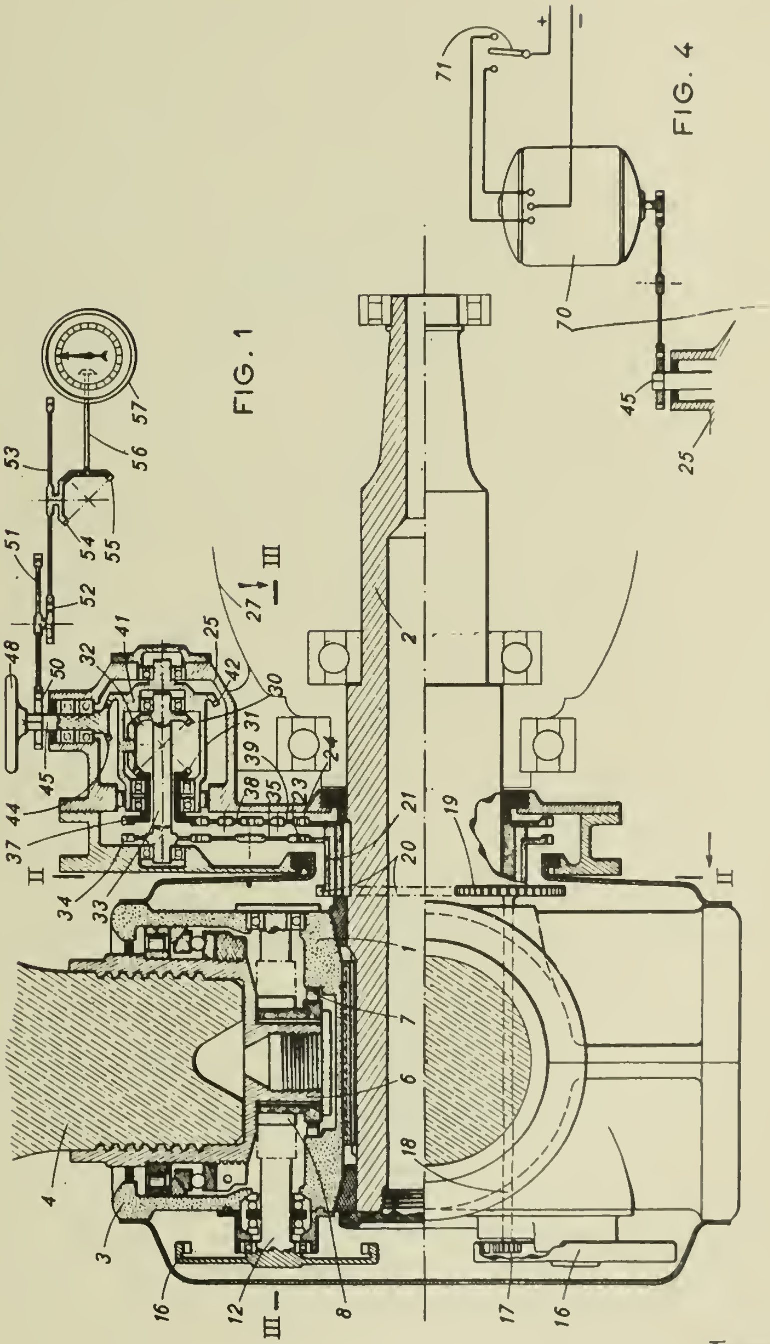
When the shaft 45 is locked, the sun wheels 30, 31 rotate at the same speed and in opposite directions, so that the set of teeth 23 and the sleeve 21 are driven at the same speed and in the same direction as the shaft 2, relatively to which they are thus unmovable. Hence, as the transmission existing between said sleeve and the shaft 12 of each blade will not effect any movement relatively to shaft 2, the pitch of the blades remains unchanged.

By impressing a turning movement in one or the other direction on the shaft 45, the equality of speed of the planet wheels will be broken and sleeve 20 will receive a turning movement of corresponding value relatively to propeller shaft 2. This turning movement is transmitted, with suitable elevation, to each of the shafts 12 by the driving connection comprising wheel 19, shaft 18 and pinions 17, 16, resulting in an axial movement of each of the nuts 10, these in turn compelling the co-operating blades to alter their angular position by a corresponding angular movement, by means of the rack 9 and the wheel 8, this angular movement being dependent upon the turning movement given to shaft 45. The pitch of the propeller is thus positively controlled by said shaft, the angular position of which is transmitted to the indicator 51, on which said pitch may thus be read at any time.

This invention is, obviously, in nowise limited to the embodiments shown and described above, as these have only been given as examples.

CHARLES RAYMOND WASEIGE.

PUBLISHED | C. R. WASEIGE | Serial No.
MAY 18, 1943. | SCREW PROPELLER PITCH ADJUSTING DEVICES | 385,563
BY A. P. C. | Filed March 27, 1941 | 2 Sheets-Sheet 1



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MAY 18, 1943.
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SCREW PROPELLER PITCH ADJUSTING DEVICES

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2 Sheets-Sheet 2

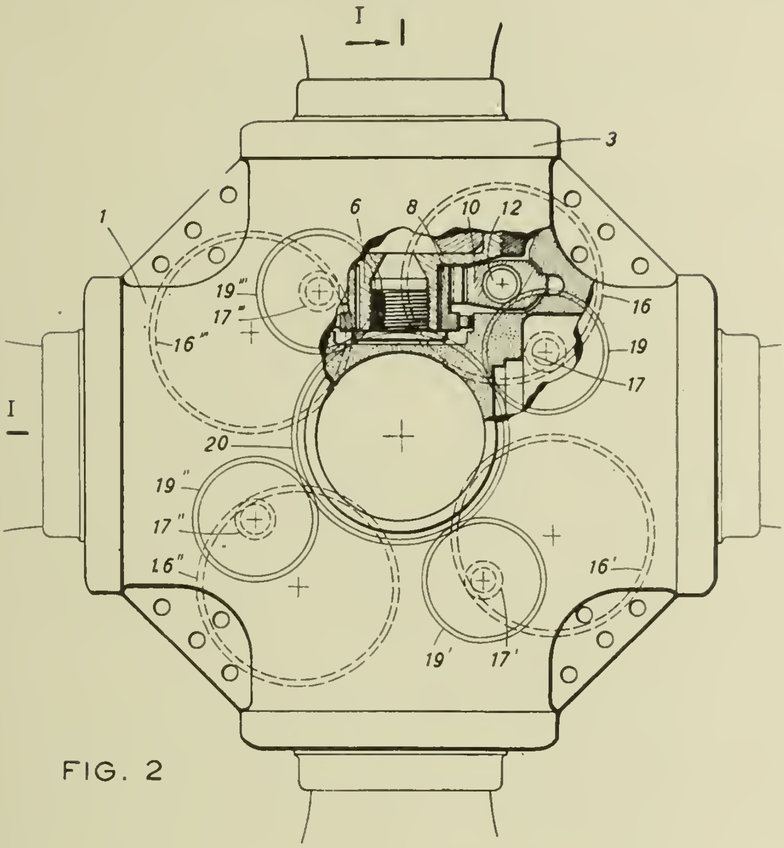

FIG. 2

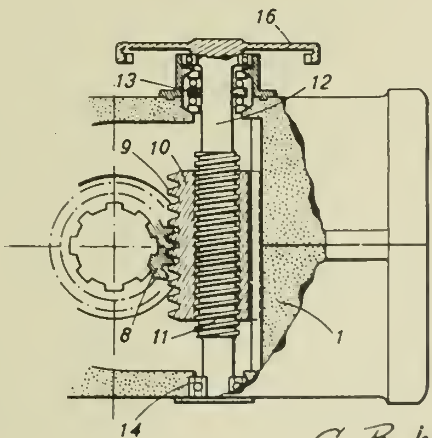

FIG. 3

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ALIEN PROPERTY CUSTODIAN

GONIOMETER COILS

Friedrich Brinkmann and Fritz Spremann, Berlin, Germany; vested in the Alien Property Custodian

Application filed April 1, 1941

The present invention relates to a method of and means for manufacturing high frequency coils, such as goniometer coils and the like.

In order to secure the desired operation of coils for high frequency devices, it is frequently desirable to apply the conducting means to the interior of the coil-supporting body instead of attaching this means to the outer face of the body, as has heretofore been customary. It is, of course, possible to provide the inner surface of a coil-supporting body with suitable grooves or recesses adapted to receive the conducting means which is then secured in its position with adhesive strips or similar fixing means. However, an arrangement as outlined above suffers under the disadvantage that the conductor or conducting means must have a certain rigidity and stiffness so that a relatively large cross-section is required, and this requirement in turn makes the device rather bulky and difficult to handle.

It is the primary object of this invention to overcome the above disadvantages by using very thin conductors which require a minimum of space. It is a further object of the invention to apply and to secure this conductor or conductors of minimum cross-sectional area to the inner surface of a tubular supporting member of artificial resin so as to form an improved coil for high frequency devices.

The invention will be fully understood from the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 shows a conductor arrangement prepared for attachment to the inner surface of a coil-supporting body, Fig. 2 shows a prepared supporting body, Fig. 3 is a modification of the device shown in Fig. 2, Fig. 4 indicates the means for carrying the invention into effect, Fig. 5 is a perspective view of a complete high frequency coil according to the invention, while Fig. 6 is a longitudinal cross-section through the coil shown in Fig. 5.

It will be assumed that the method according to this invention will be used for manufacturing a goniometer coil having a short-circuited conductor ring which consists of a plurality of conductors connected in parallel in order to avoid eddy current losses.

This conductor means which is shown in Fig. 1 is made up from a thin sheet of copper having a thickness of say .0008''. Two longitudinal slots in the central portion of the copper foil divide this into three parallel straps 1, 2 and 3 which form the individual turns of the coil. The slots are shorter than the length of the metal foil so that the three parallel straps are short-circuited by further straps 4 at right angles to and integral with the straps 1, 2 and 3. The so prepared metal foil is then rolled or treated in any other manner so as to assume a substantially tubular shape as shown in Fig. 1.

The coil-supporting body is formed in the shape of a cylinder from any suitable moulding material selected from the group of artificial resins. The inner diameter of this cylindrical body is slightly larger than the outer diameter of the substantially tubular conducting means described in the last paragraph and shown in Fig. 1. This body is preferably pressed in a die at a relatively low temperature so that the resin will not yet be converted into its final state which it generally assumes in the course of the final moulding process at high pressure. The product resulting from this first moulding process is shown at 7 in Fig. 2, while Fig. 3 shows a modification in which the body is provided with a slot parallel to its axis.

The two components mentioned above are then combined with one another in a single operation by using a die as shown in Fig. 4. The substantially tubular conductor means according to Fig. 1 is first slid over a mandrel 6, whereupon the cylindrical body 7 is placed around the metallic member. The die comprises four equally spaced radial jaws 8 adapted to grip the outer surface of the cylinder 7. The whole assembly is then heated from the exterior in any well-known manner and, when the jaws are urged inwardly, the soft resin is brought in intimate contact with the conductor means 5, the inner diameter of which is kept at a constant size by means of the mandrel 6.

It is thus possible as taught by the above-described process according to the invention to produce high frequency coils, in which the conductors forming the winding are attached to the inner surface of a coil-supporting body and in which the cross-sectional area of the conductors is a minimum.

A complete coil as a product of manufacture according to the invention is shown in Fig. 5, while Fig. 6 is a longitudinal cross-section through the device shown in Fig. 5.

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PUBLISHED
MAY 18, 1943.
BY A. P. C.

F. BRINKMANN ET AL

GONIOMETER COILS

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Fig.1

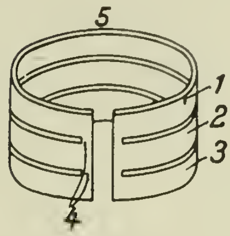


Fig.2

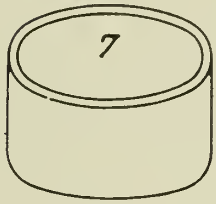


Fig.3

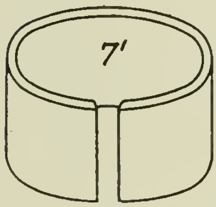


Fig.4

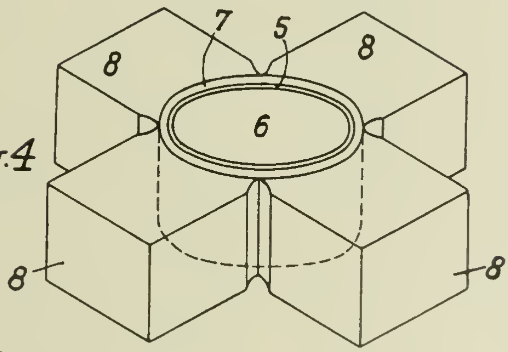


Fig.5

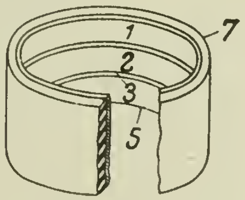
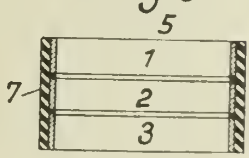


Fig.6



INVENTOR.
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Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

PROCESS FOR ATTACKING ALUMINUM FOR INCREASING ITS WORKING SURFACE AND APPARATUS THEREFOR

Georges Gedal Guterman, Paris, France; vested in the Alien Property Custodian

Application filed April 7, 1941

The present invention relates to a process and means for obtaining an increase of the working surfaee of electrodes such as employed in making alternating-eurrent rectifiers, lightning discharge arresters, electrolytic condensers and the like.

It is an object of this invention to provide on the surfaces of selected metal roughnesses formed by infinity of microscopic concavities and convexities so as to increase these surfaces without changing external dimensions of the treated metal, more particularly without modifying or altering its electrieal characteristics.

Several proposals have hitherto been made for increasing the working surface of electrodes either by corrosion or by meehanical or chemical methods. In the mechanieal methods heretofore known there is a notable inconvenience consisting in leaving on the treated surface foreign metal traces due to rolling cylinders or stamping dies and extremely difficult to eliminate, because of their being incrustated in the treated metal, in the case where the purity of the metal is one of the required conditions for a good effieiency of the treated electrode. As to known chemical methods, there is generally employed a solution made of distilled water and of chloride of a metal, such for example as iron, copper or nickel. In this case the metal under treatment, for instance aluminum, because of being electro-negative with respect to said metals, an exchange of layers oecurs and a metal deposit on the electrode thus treated is formed. No subsequent washing by nitric or sulphuric acid can bring about the elimination of foreign metal electrical characteristics of which frequently totally differ from those of the treated metal intended to constitute the electrode, whereby very poor results and unemployable electrodes are generally obtained.

In electrolytic processes heretofore propounded acid or acidulated baths used or proposed are practically unemployable, because the reaetion taking place during the attack in the bath gives rise to a deposit of hydrate for example of aluminum in the form of hydrogel and hydrosol, according to the temperature and other factors used. As the concentration of hydrate increases, the latter becomes polymerized and passes from the hydrate $Al^2O^3(OH)^1$ to $Al^2O^3(OH)^2$, then to $Al^2O^3(OH)^3$ and so on. According to the more or less important quantity of transformed alumina, a concentration is there so rapidly established that at the end of several hours nodules are formed which very rapidly transform the bath into a compact unemployable mass. Basic baths only give rise to a powdery deposit of alumina (precipitation of hydrate in basic medium) constantly remaining in the bath without hindering its action, and such a bath holds good almost endlessly.

In the case of electrodes for lightning discharge arresters or electrolytic condensers the purity of the metal used is quite necessary and in the case of aluminum, for example, has been pushed up to 99.99%.

There is only a very limited number of metals hitherto known which have the property of becoming covered with a light metallic layer of oxide so as to permit the electric current to pass in one direction only and to utilise such property for the construction of apparatuses such as alternating-eurrent rectifiers, lightning discharge arresters and electrolytic condensers.

In the case of electrolytic condensers the alternating current passes through capaeity. The latter is extremely high in such condensers owing to the highly reduced thickness of the insulating material which in this case is a layer of oxide of the order of one micron-millimeter, such layer retaining one of the alternations of the current in the case of filtering cells.

The several metals having the said property to a sufficiently high extent are tantalum, aluminum and magnesium. These metals, when treated under the same conditions (same solutions and same temperatures) form layers having electrical characteristics quite differing from one another and determined according to the metal employed. A plate of metal, treated with a convenient solution and after treatment having on its surfaee any impurity, however small it may be, will give rise in the subsequently operated apparatus provided therewith to a potential difference, due to the impedance difference of the layer between the particle of foreign metal and the remainder of such plate, such as to cause a local current flow, local overheating, rapid clacking and other inconveniences resulting in quickly putting the apparatus out of use.

As to the cathode, it has been proposed to utilise nickel and/or carbon, which both theoretically appear to be susceptible of being used as cathodes without apparent inconveniences. However, these conductors are in reality unemployable.

Thus, nickel when used as cathode in the attacking bath would itself be attacked. During the working period of the bath this inconvenience need not be feared for, but it may become effective when the respective apparatus be at rest, or while its electrodes be changed, or for any other reason. In the case of a nickel cathode, for example, a layer of greenish colour would be formed on the surface of the electrolyte and in the close vicinity of the cathode. A band of pure aluminum under such treatment would, therefore, be infected by deleterious impurities.

On the other hand, carbon would separate from the cathode in the form of brownish particles which would mix with the electrolyte and

then deposit themselves onto the metal under treatment, from which they could no more be withdrawn, thus resulting in the same inconveniences as those inherent to hereinbefore mentioned mechanical and chemical methods.

Several known processes prior to the present application have proved to be merely theoretical and unable to resist to their carrying into practical effect.

The present invention has for its main object to dispense with the hereinbefore mentioned inconveniences by employing an electrolytic process permitting the metal under treatment to conserve all of its initial purity, owing to the use of alkaline metals, such as sodium and potassium, hydrates of which constitute strong bases and the dissolution of which in a suitable simple washing bath presents no difficulty, whereby all impurities become fully eliminated.

According to the invention, the electrode to be treated is immersed into a solution made of distilled water and of a halogen of sodium and potassium, several grams of potash or caustic soda being preliminarily added thereto. Such electrode is adapted to constitute the anode, while a second electrode forms the cathode. The tension at the electric terminals of the bath is adjusted according to the intensity of the available current. The aspect of the attack is, therefore, adjustable in accordance with desirable concavities of diminsions reduced or not. Such aspect depends on the current intensity and on the period of immersion of the metal in the electrolyte, and on the quantity of salt incorporated into the electrolyte.

In this way there is effected an attack by means of electrolysis of metallic surfaces forming the electrodes, the electrical capacity being function of the surface of such electrodes.

In order to show how the invention may readily be carried into practical effect, the same will now be described, by way of example only, with reference to the accompanying drawing in which:

Figure 1 diagrammatically shows a longitudinal sectional view of an apparatus designed for embodying the process according to the invention;

Figure 2 is an enlarged sectional view of a cathode arrangement for effecting an electrolytic attack according to the invention.

In the drawing, I designates a band of metal to be treated, adapted to be displaced longitudinally of the apparatus by means of rollers **2** adapted to lead the band successively into and through tanks **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**, **11**, **12**, **13** and **14**. The tanks **4**, **11** and **12**, which contain baths for the electrolytic attack of the band I, are provided each with a cathode **15**, **16**, **17**, respectively. Such cathodes may be constituted by a thin platinum sheet or plate **18** closely surrounding a nickel sheet or plate **19**.

The band I of a metal, such for example as aluminum, to be attacked is guided by rollers **2** adapted to displace the band successively into and through the baths contained in the tanks **3** to **14**.

The tank **3** contains a solution of about 10% soda in distilled water, such bath being provided therein for cleansing the metal band I under treatment, this band then passing into and through the tank **4** containing the first bath for electrolytically attacking the band. The tank **4**, preferably of glass, contains for example the following solution:

Distilled water	liter	1
Bromide of potassium	grams	50
Potash or caustic soda	do	5 to 10

in which is also immersed the electrode **15** constituting the cathode.

The band I of metal to be treated passes then into and through the baths contained in washing tanks **5** and **6** each of which contains distilled water, whereafter the band passes into and through the tank **7** containing nitric acid for dissolving hydrate remaining on the band. From the tank **7** the band I passes into and through the tank **8** containing a solution of distilled water and ammonia at 22° for neutralising the nitric acid. The tanks **9** and **10** contain distilled water for a further washing. The tanks **11** and **12** are electrolytic attack tanks for depositing the stop layer onto the metal under treament with a view to constructing electrolyte condensers, current rectifiers and the like. Finally, the tanks **13** and **14** are final washing tanks containing distilled water.

For the attacking bath in the tank **4** preferably platinum will be employed to constitute the cathode **15**, other metals, such as nickel, being liable to be attacked. A cathode of good quality may be constituted by a very thin sheet of platinum firmly affixed to a nickel support by any suitable mechanical means. Such a cathode when properly protected against infiltrations of the electrolyte between the platinum and nickel will be practically unconsumable.

It will be advantageous to conveniently adjust the intensity of the current in order to obtain a normal attack and treatment of the metal so as to impart to the latter the best possible qualities of utilisation. If the attack is violent, very deep concavities of very large dimensions will be obtained, but the attack will be irregular resulting in a plurality of spots disseminated all over the surface. As the violence of the attack will be attenuated, the depth of concavities accordingly will decrease, while the frequency of spots on the surface of the treated metal will increase until uniformity of colour on the entire surface will have been reached.

The distance between the electrodes will be about 10 centimeters, while the tension applied to the terminals will be about 20 volts under 0.35 to 0.5 amperes per square centimeter.

It will be evident that modifications of detail, such as may be dictated by practical considerations, may be made in the process and apparatus hereinbefore described and shown, without departing from the scope of the invention, for the proportions and combinations given are susceptible to vary.

It will be further understood that for carrying the process of this invention into practical effect, without departing from its scope, recourse may be had to any and all technical means and mechanical, electrical and other devices, constructional details of which may vary according to circumstances, necessities of manufacturing and applications.

Thus, the solutions of alkaline metals hereinbefore referred to may vary in order to obtain attacks suitably variable.

(GEORGES) GEDAL GUTERMAN.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

G. GUTERMAN

PROCESS FOR ATTACKING ALUMINUM FOR INCREASING ITS WORKING SURFACE AND APPARATUS THEREFOR

Filed April 7, 1941

Serial No. 387,252

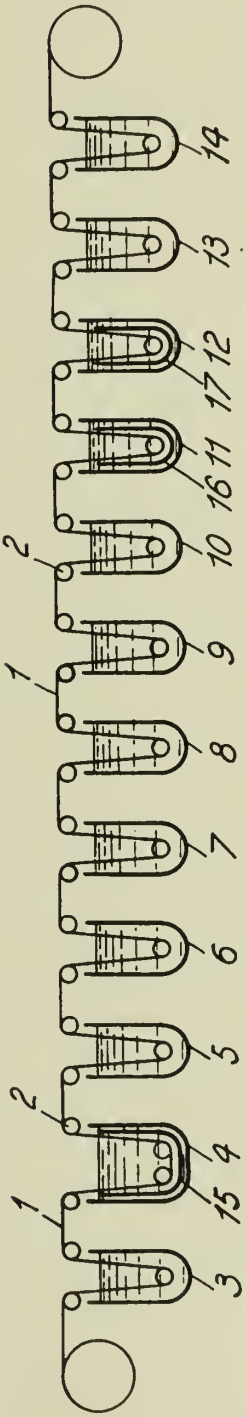

Fig. 1.

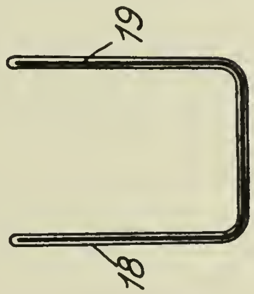

Fig. 2.

Inventor

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Attorneys

Published May 18, 1943 Serial No. 387,508

ALIEN PROPERTY CUSTODIAN

INSULATED ELECTRIC CONDUCTOR

Oswaldus Anthonius Jacobus van Lin, Venlo, and Johannes Hoekstra, Eindhoven, Holland; vested in the Alien Property Custodian

No Drawing. Application filed April 8, 1941

For insulating electric conductors it is known to make use of insulating layers consisting either of rubber hydrochloride or containing rubber hydrochloride as a chief constituent.

Such insulating layers which can be easily made by means of the material commercially known as "Pliofilm" have excellent electric properties; moreover, they are elastic and have a particularly great mechanical strength. Such an insulating layer may be applied in form of an envelope, for instance by wrapping with band-shaped material followed by heating as a result of which the windings stick together.

In spite of the fact that these insulating layers are also impermeable to water such an insulating layer is often insufficient without the intervention of other means, because a great part of the excellent electric properties becomes lost upon contact with liquid water. Particularly the disruptive strength sometimes decreases to 0.1 of the initial value and the electric resistance drops appreciably.

The present invention has for its object to avoid this drawback in order that the particular properties of the insulating layers in question may be utilised as much as possible.

To this end, the insulating layer consisting of rubber hydro-chloride or containing rubber hydrochloride as a chief constituent is, according to the invention, coated with an insulating layer which entirely or substantially consists of chlorinated rubber containing more than 60% by weight of chlorine. Such a layer, which can be easily applied in form of a solution of lacquer followed by drying, has the advantage over other layers impermeable to water of being very impermeable and resistant to water and, in addition, of possessing excellent electrical properties such as break-down voltage, insulation resistance and dielectric losses.

In contradistinction thereto, however, a drawback consists in that the layer of chlorinated rubber is very sensitive to temperature variations in regard to its mechanical properties, so that it is very difficult to make a layer which is not brittle at low temperatures and, in addition, is not sticky or soft at high temperatures, which may be desirable in some cases.

Therefore, in one form of carrying the invention into effect, the layer of chlorinated rubber impermeable to water may be covered with an elastic layer having a great mechanical strength at low and high temperatures. Such a layer can be obtained in known manner by applying it in form of a solution of cellulose lacquer followed by drying; as an alternative this may be effected by making use of a layer of rubber hydrochloride.

Moreover, a greater rigidly and ductility of the whole of the insulating layer is obtained according to this executional example.

For making the invention better understood it may still be observed that directly coating the insulating layer of rubber hydrochloride with the elastic layer having a great mechanical strength referred to above does not yield the results obtained according to the invention, because such layers generally do not approximate the impermeability or resistance to water of the said layer of chlorinated rubber.

Example

A stranded conductor consisting of six steel wires of 0.35 mm in diameter and two copper wires of 0,35 and 0,5 mm in diameter respectively is twice wrapped in opposite sense with a film of rubber hydrochloride (e. g. "Pliofilm") having a width of 2,5 mms and a thickness of 0.03 mm. This envelope is fused together by heating for a short time at 110 to 120° C and then coated with a layer consisting, for instance, of 33% by weight of tricresylphosphate and 67% by weight of chlorinated rubber having a high viscosity. This layer may be provided in several layers by painting a solution e. g. in benzene by means of a nozzle followed by drying of the whole layer which is preferably effected by raising the temperature stepwise or continuously during this drying operation. On to this layer is applied a layer of lacquer consisting, for instance, of 57% by weight of acetylcellulose, 13% by weight of triphenyl phosphate and 30% by weight of tributylphosphate which is followed by drying also this layer. After that the wire thus insulated may still be covered in a known manner with a flax braiding which may be coated in known manner with a compound containing asphalt bitumen.

The invention is of particular importance for weak current conductors destined for non-permanent telephonic and telegraphic connections where use is often made of a core usually consisting of a plurality of single metal wires, which core has a high tensile strength, for instance of more than 75 kg/mm^2 and requires a thin, light and strong insulating envelope having a high insulation resistance, as can be obtained according to the invention.

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Published May 18, 1943

Serial No. 387,673

ALIEN PROPERTY CUSTODIAN

SELF-INTERRUPTERS

Gerhard Schmidt, Berlin, Germany; vested in the Alien Property Custodian

Application filed April 9, 1941

This invention relates to automatic circuit breakers or so-called self-interrupters and is more particularly concerned with a novel circuit arrangement therefor, the aim being to provide for a perfectly constant frequency in the operation of such devices.

In the prior art self-interrupters are known which comprise a polarized relay and means, such as resistance and condenser, arranged in addition to this relay to determine a desired frequency at which the self-interrupter is to operate, the dimensions of such resistance and condenser or the like being calculated to achieve this. However, the frequency condition so obtained is extremely unsteady.

In arrangements as provided by the invention the current for the self-interrupter is made to synchronize the vibrations thereof. The fundamental frequency or any harmonic may be used for effecting such synchronization.

One embodiment of the invention comprises means to rectify an alternating current for the self-interrupter and to smooth the resultant ripple current to such extent only that there is a residual ripple for effecting the said synchronization. It has been found that a ripple of 3% will be quite sufficient.

The drawing is a diagram showing an embodiment of this kind.

P denotes a polarized relay having two windings I, II and a contact p. C_1 indicates a condenser, W a resistance, R a potentiometer, C_2 a smoothing condenser for a rectifier G, while T denotes a supply transformer connected to an alternating current source. The series connections C_1, I and W, II are joined in parallel to contact p, and to potentiometer R which to such end is tapped in its center point.

With contact p in the position shown in the drawing, there is a circuit $-$(G), p, C_1, I, R, $+$(G) and a second circuit, namely, $-$(G), p, W, II, R, $+$(G).

While condenser C_1 is being charged, a current flows over winding I. This current is much greater than the current over W, II. When condenser C_1 has been charged the current in winding I ceases. Consequently, winding II becomes effective so as to switch the contact p. During the period of the contact changing from the position shown to the other or opposite position the condenser C_1 discharges over II, I so that there is a flow of current also during that period. With contact p in the operative position, not represented in the drawing, the current in the self-interrupter flows in the direction which is the reverse of the former. This time, therefore, the condenser C_1 discharges in the direction likewise the reverse of the former direction of discharge, whereby after the recharging of condenser C_1 the described operation recurs so as to return the contact p to the position shown in the drawing. It will be seen that in this way the arrangement is suitable for interrupting and closing a circuit continuously.

The instant at which the charge of condenser C_1 has become so small that the winding II begins to be in preponderance of winding II is not steady for obvious reasons and hence is easy to influence by means of small variations of voltage, such as those constituted by a ripple current. It will thus be seen that the aforesaid residual ripple is a means for synchronizing the vibrations of contact p.

GERHARD SCHMIDT.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

G. SCHMIDT

SELF-INTERRUPTERS

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Serial No.
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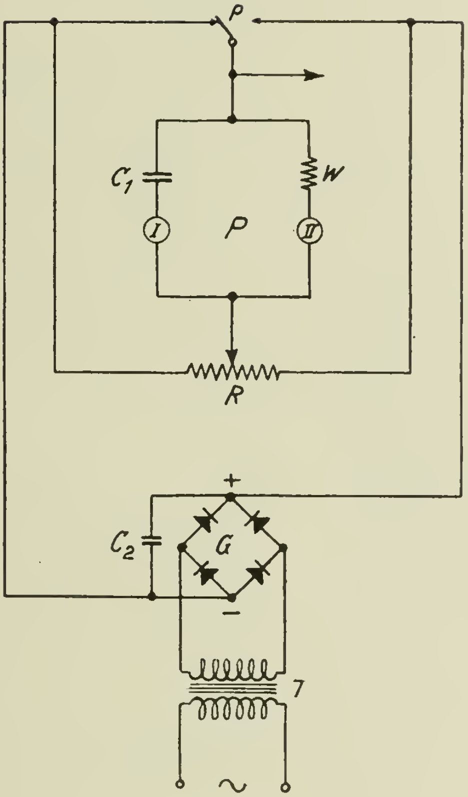

Gerhard Schmidt

by

INVENTOR.

Att'y

BY *[signature]*

Published May 18, 1943 Serial No. 387,768

ALIEN PROPERTY CUSTODIAN

DEVICE SUITABLE FOR CHARGING BATTERIES

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Application filed April 9, 1941

The invention relates to a device suitable for charging batteries and having a voltage-current characteristic which varies slightly in the case of comparatively small loads and, on the contrary, yields a limitation of current in the case of larger loads. According to the invention, the device is characterized more particularly in that it comprises the primary winding of a saturated transformer, which winding is connected in series with a condenser to a source of alternating current, and an unsaturated transformer connected in parallel therewith to the source of alternating current whilst the secondary windings of the two transformers supply in series a rectifier and the no-load voltage of the unsaturated transformer has been so chosen with respect to that of the saturated transformer that upon the passage from the current-limiting portion of the said voltage-current characteristic to that portion thereof which varies slightly in voltage a voltage maximum is passed through. According to the invention, the series-connection of the secondary windings of the two transformers is such that when the condenser connected in series with the primary winding of the saturated transformer is short-circuited, the secondary voltages of the two transformers are in phase.

Thus the advantage is obtained that in a region of high current intensity which pertains to the said voltage maximum a comparatively high voltage is available, by which losses of voltage in this region of current intensity may be compensated to a more or less high extent.

More particularly for charging batteries, for example in an arrangement as a buffer battery, this affords the advantage that after a great consumption of current by the load, that is consequently to say when the state-point moves from the current-limiting portion to the portion which varies slightly in voltage, the battery, so long as the voltage thereof has not yet attained the said voltage maximum, is steadily charged with a high current intensity, which, of course, should still be allowable for the battery, so that the charging period is comparatively short.

When the device is utilised for charging batteries, the voltage maximum should preferably have a value such that upon the attainment of this maximum, the battery is in a desired state of charge, for example, in a state such that the voltage corresponding to this stage of charge is appropriate for the load.

After the voltage maximum has been attained, the operating point (state-point) moves, when the charging is continued, in jumps along that portion of the voltage-current characteristics which varies slightly in voltage to a point of higher voltage in the voltage-current characteristic. This point is located in a portion which steadily increases in voltage in the region from low current intensity to a current intensity equal to zero. By providing a properly chosen base-load, it is possible to maintain the state-point in this portion of the current-voltage characteristic at a determined minimum of current intensity and thus at a determined maximum voltage which has been properly chosen in view of the load.

The secondary voltage of the unsaturated transformer is in general small with respect to the saturated transformer. It should, however, not be taken too small since else the voltage maximum in the above-mentioned passage, which is desired according to the invention, does not occur with higher current intensities.

It should be observed that in the above-mentioned cases all the advantages of a voltage-current characteristic having a portion which varies slightly in the case of comparatively small loads and a portion which yields a current-lamination in the case of larger loads, are retained.

In the following description of the drawing one embodiment of the invention will be described, by way of example, with reference to the diagrammatic figures.

In Fig. 1 the primary winding **1** of a highly saturated transformer **2** is connected, in series with a condenser **3**, to alternating current mains **4**. In parallel with the latter is connected the primary winding **5** of an unsaturated transformer **6**. The two secondary windings **7** and **8** supply in series a Grätz-system of rectifiers **9** which is connected through a choke coil **10** to a battery, for example, a buffer battery **11**. A load in parallel with the battery **11** is denoted by **12**.

By a proper choice as regards the no-load voltage of the unsaturated transformer **6** it is possible to obtain a voltage-current characteristic such as is shown in Fig. 2. The portion **13** exhibits a voltage E which varies slightly in the case of comparatively small loads whilst the portion **14** yields a current limitation upon larger loads.

According to the invention, the passage from the portion **13** to the portion **14** of the characteristic exhibits a voltage maximum which is located on the graph at a current intensity of about 3.3 amps. After the consuming apparatus **12**, which may be, for example, a telephone exchange, has consumed a heavy current of say 3.5 amps., the battery will be charged with a high current intensity according to the portion

14 of the characteristic up to the voltage maximum of 62 volts which is located in this portion of the characteristic. This value has been chosen so as to be appropriate for the consuming apparatuses. Thus, for example, with automatic telephone exchanges use is made, for example, of relays which must not yet spark at the said voltage although, on account of the required sensitiveness, they respond even in the case of small voltage variations.

Upon a further increase of the battery voltage the state-point on the characteristic 14 jumps from 3.3 amps. to the point corresponding to 0.7 amp. of the characteristic 13, so that the charging of the battery may be slowly continued with a very low current intensity to a maximum of 65 volts until a new consumption of current causes a displacement to the right of the state-point on the characteristic. If, in view of sparking of the relays, the said voltage of 65 volts should be too high, it is possible, by utilising a base-load, for example a properly chosen resistance in parallel with the output terminals of the rectifier, to maintain a minimum consumption of current such that in the state-point the voltage remains below the sparking voltage of the relay.

As may furthermore be seen from the figure the portion 13 exhibits a slight diminution of voltage in the case of an increasing load.

From a great number of observations it has been found possible to draw up an empiric formula which may be utilised in many cases.

According to this formula the no-load voltage in volts on the unsaturated transformer must be taken larger than

$$K.\ f.\ W_2.\ F.\ 10^4$$

wherein K represents a factor which depends on the material of the magnetic circuit of the unsaturated transformer whilst f, W_2 and F represents the frequency of the mains (for example 50 or 60 cycles), the number of turns of the secondary winding of the saturated transformer and the cross-sectional area of the magnetic circuit of the saturated transformer in square cms. respectively.

In one embodiment of the invention highly alloyed transformer sheet metal with which the above-mentioned factor K was from 1.2 to 1.3 was taken for the material of the unsaturated transformer.

The curve 13, 14 applies to a mains voltage of 220 volts whereas the curves 15, 16 and 17, 18 apply to a mains voltage which is 5% lower and 5% higher respectively. It is distinctly clear therefrom that variations in the mains voltage have substantially no influence on the horizontal portion and have a comparatively slight influence on the steep portion of the characteristic.

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EWOUT CASSEE.

PUBLISHED MAY 18, 1943. BY A. P. C.

H. A. W. KLINKHAMER ET AL

DEVICE SUITABLE FOR CHARGING BATTERIES

Filed April 9, 1941

Serial No. 387,768

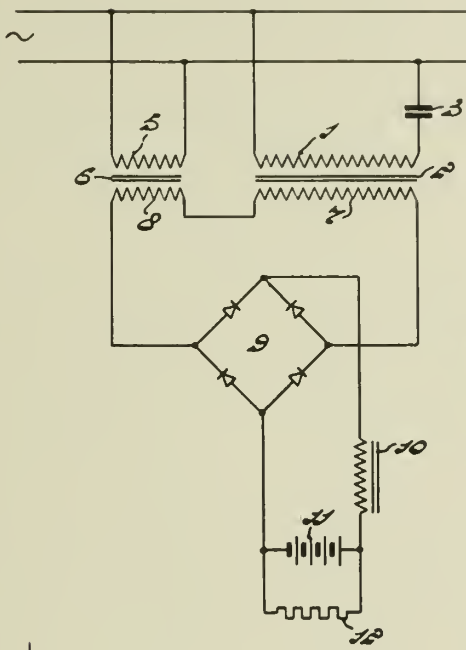

Fig. 1

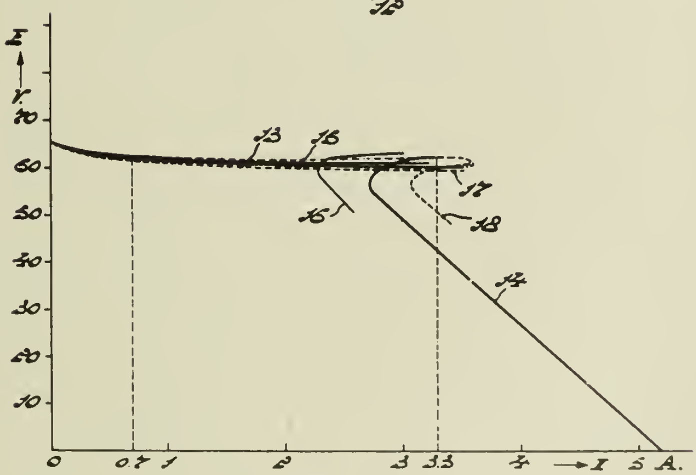

Fig. 2

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By E. F. Wenderoth

ATTORNEY

Published May 18, 1943

Serial No. 387,780

ALIEN PROPERTY CUSTODIAN

DEVICE FOR CONVERTING VARIATIONS OF A MECHANICAL QUANTITY INTO VARIATIONS OF AN ELECTRIC VOLTAGE

Pieter Heertje Dijksterhuis, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed April 9, 1941

This invention relates to a device for converting variations of a mechanical quantity into variations of an electric voltage by alteration of the value of an impedance under the influence of the mechanical quantity, there being a non-linear relation between the voltage across the impedance and the mechanical quantity.

The mechanical quantity may be, for example, the pressure occurring in the cylinder of an internal-combustion engine of the shape of a machine component which is subjected to variations in form or place under the influence of mechanical forces. The impedance may be constituted, for example, by an electrical resistance whose value becomes modified by variation in pressure or shape or may be constituted by a condenser in which the distance between the electrodes is dependent on the magnitude of the mechanical quantity.

Due to the absence of a linear relation between the mechanical quantity to be converted into an electric alternating voltage and the output voltage a device of the said kind is not well adapted as a measuring device. According to the invention, this disadvantage is obviated by feeding the voltage across the impedance or a voltage dependent thereon to a transmission circuit whose damping depends in such manner on the voltage supplied that the non-linear nature is balanced.

Preferably, in a device in which the variations of the mechanical quantity are converted into a modulation of a high-frequency alternating voltage by variation of the value of a condenser which is influenced by the mechanical quantity the modulated high-frequency voltage is fed to an amplifier from which a control voltage dependent on the instantaneous value of the enveloping curve of the modulated high-frequency voltage is obtained, said control voltage varying the amplification of one or more of the amplifier valves so as to ensure a linear relation between the amplified modulated high-frequency voltage and/or the low-frequency voltage obtained after detection of this voltage and the mechanical quantity, the word "damping" being here employed to define the ratio of the output voltage to the input voltage of the transmission circuit.

In order that the invention may be clearly understood and readily carried into effect it will now be set out more fully with reference to the accompanying drawing in which a preferred embodiment of the invention is diagrammatically shown by way of example.

Referring to Fig. 1, **1** designates a generator for setting up high-frequency oscillations whose output voltage is fed via a transformer **2** to a bridge connection **4** comprising four condensers **6**, **8**, **10** and **12**. One of these condensers, for example **10**, serves for converting variations of a mechanical quantity, for example variations in pressure, into variations in capacity. This condenser comprises a stationary electrode and a simple preferably plane diaphragm-shaped electrode, the latter being influenced by the variations in pressure to be converted; the flexion of the diaphragm thus brought about alters the distance between the electrodes and results in variations in capacity.

The bridge connection **4** is preferably so adjusted that if the pressure exerted on the diaphragm-shaped electrode is zero there is no voltage between the corners **7** and **9**. Any increase in pressure has the effect of decreasing the distance between the electrodes of the condenser **10** and thus of increasing the capacity with the result that the corners **7** and **9** of the bridge connection have occurring between them a high-frequency voltage whose amplitude depends on the voltage across the condenser **10** and hence on the variations in pressure that occur.

The modulated high-frequency voltage between the terminals **7** and **9** is fed via a condenser **14** and a leak **16** to the control grid of an amplifier valve, for example a pentode **18**, whose cathode lead includes a resistance **20** with a parallel condenser **22** for the obtainment of the negative grid bias. The anode circuit of the valve **18** includes an oscillatory circuit which comprises a condenser **24** and a coil **26** and is tuned to the frequency of the generator **1** and in addition a source of anode voltage, for example a battery **18**. The anode of the valve **18** is connected to the anode of a diode **32** by the intermediary of a coupling condenser **30**. The cathode of the diode **32** is earthed and the anode is connected to a load resistance **38**, earthed on the other side, via a filter that arrests the high frequency oscillations. A variable tapping **39** on the resistance **38** is connected to the leak **16** via a conductor **40**, whereas a second tapping **41** on the resistance **38** leads to one of the output terminals **42**. The other output terminal **42** is earthed, as is also the corner **7** of the bridge connection **4**.

The modulated high-frequency voltage occurring between the corners **7** and **9** of the bridge connection **4** is amplified in the transmission circuit that comprises the amplifier valve **18** and diode **32** by the valve **18** and rectified by the detector **32**. The rectified output voltage whose

amplitude is a measure of the variations in pressure that occur may be obtained from the terminals 42 and fed to an indicating device.

If particular precautions are not taken the characteristic curve by which the voltage V occurring between the terminals 42 is indicated as a function of a pressure p converted into an electric voltage has a non-linear course, as may be shown by the curve 50 of Fig. 2, with the result that the voltage V which occurs between the terminals 42 is not well adapted for measuring the absolute value of the variations in pressure that occur.

In order to balance the non-linear nature concerned which is brought about by the non-linear relation between the variation in capacity of the condenser 10, which occurs as a result of variations in pressure, and the pressure p a variable part of the rectified voltage, which voltage is dependent on the instantaneous value of the enveloping curve of the high-frequency voltage amplified by the tube 18, is fed as a negative bias to the control grid of the valve 18 via the tapping 39, the conductor 40 and the resistance 16. This measure has the effect of rendering the amplification of the valve 18 dependent on the supplied voltage in such manner that if the pressure p increases the working point on the grid-voltage anode-current characteristic curve of the valve 18 is displaced to a region of higher negative grid voltage where the mutual conductance and hence the gain is lower. Greater amplitudes of the high-frequency voltage are consequently subjected to a lower amplification. The tapping 39 on the resistance 38 permits of so varying the value of the voltage that controls the gain that the valve 18 has a complementary amplification characteristic curve of the output voltage V as a function of the input voltage V_i so that the characteristic curve which shows the voltage V as a function of the pressure p is given a straight-line shape which is indicated by the curve 52 of Fig. 2.

Instead of the voltage which controls the gain of the valve 18 in accordance with the value of the high-frequency voltage fed to the valve 18 being derived from the detector 32 it may also be obtained from an independent detector which is arranged in front of the detector valve 32.

Instead of being obtained by a control of the gain as in the embodiment described, the desired characteristic curve of the transmission circuit may also be obtained otherwise, for example by a suitable choice of the valve characteristics.

PIETER HEERTJE DIJKSTERHUIS.

PUBLISHED

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BY A. P. C.

P. H. DIJKSTERHUIS
DEVICE FOR CONVERTING VARIATIONS OF A MECHANICAL QUANTITY INTO VARIATIONS OF AN ELECTRIC VOLTAGE
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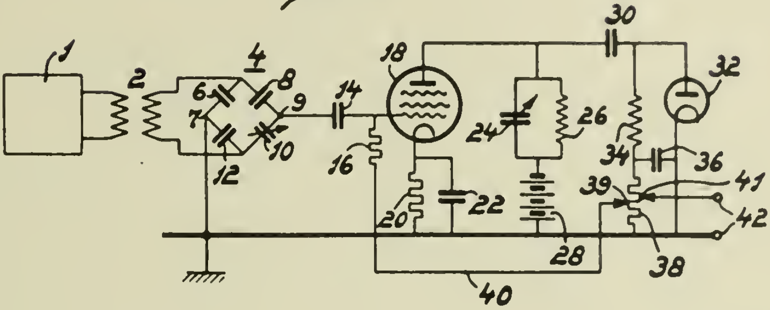
Fig. 1



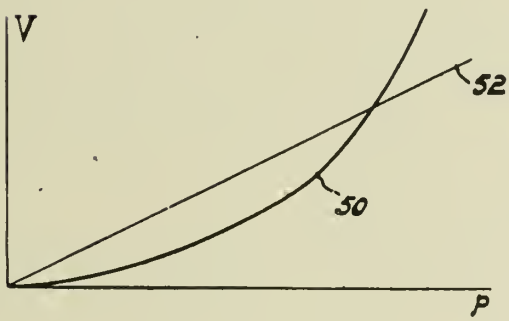


Fig. 2

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ALIEN PROPERTY CUSTODIAN

CHOPPER

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Application filed April 11, 1941

The mechanical part of a chopper or vibrator of the type now mostly used represents an oscillable structure vibrating relatively free from damping. For this reason the forces required for sustaining the oscillation are small in contrast to the force required for the initial deflection of the spring blade. Hence, distinction must be made between the first or initial switching-in moment I and state II corresponding to full oscillation.

The oscillation or excursion amplitude (II) is fixed, and so is the initial deflection (I). Whence the requisite increase in force $P_I:P_{II}$ is determinable, that is to say, the factor by which the attraction force P_I must exceed the exciting force P_{II} which is active after vibrations have been built up.

For the production of the mechanical forces serves mostly a transformer with an air-gap. The latter is more or less short circuited by the vibrating keeper. Part of the aggregate flux incidentally passes by way of the keeper. The ratio of the keeper flux FA to the total flux F shall be denoted by

$$\frac{FA}{F}=FR$$

The mechanical force P by which the keeper is attracted is essentially proportional to $FA=FR\cdot F$; the requisite increase of force $P_I:P_{II}$ therefore is proportional to

$$\frac{FA_I}{FA_{II}}=\frac{FR_I.F_I}{FR_{II}.F_{II}}$$

the excess or increase of the flux $F_I:F_{II}$ being determined by the electrical conditions inherent in the circuit arrangement as well as the magnetic conditions or properties of the transformer (time-constant of the primary circuit, working utilization of the iron).

Occasionally, the above increase of flux is less than the increase of force above mentioned $P_I:P_{II}$. This applies particularly to choppers in which the primary winding of the transformer acts at the same time as the exciter winding. Because of the low voltage which is used (2.4v) and the comparatively high series resistances the growth of current upon switching in, and thus also the flux increase, remains small.

This drawback is obviated in the invention by shorting or shunting the air-gap of the transformer core by means of an iron bridge. The latter is of such dimensions that at the instant of switching-in (I) and the rise of current then prevailing, it will be more markedly saturated than the other iron parts, so that its reluctance rises more strongly. If desired, this effect could be further enhanced substantially by using iron of higher permeability for the said bridge piece. Incidentally, other dimensions must be so altered that the exciting force P_{II} stays unvaried.

An exemplified embodiment of the invention is illustrated by way of example in the appended drawing.

Opposite the pole-shoe *a* of the transformer core *b* on which the winding *c* is wrapped, oscillates the keeper *d*. The latter is attached on the spring or blade *e* which supports the contact *h*, the latter co-acting with the co-operating contact *i*. The latter is supported on a support *o* which is held on a piece of insulation material *r* which is attached to the transformer core *b*. On the same insulation piece could be supported also the blade or reed *e*.

Between the pole-shoe *a* and the pole of the iron-core *b* mounted opposite it is provided an iron bridge *s* the dimensions of which must be determined empirically. It closes or short circuits the air-gap in the core *b*, and it renders conditions so that the initial excursion of the spring or reed *e* is easier than heretofore.

ALFRED LEIFER.
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A. LEIFER ET AL
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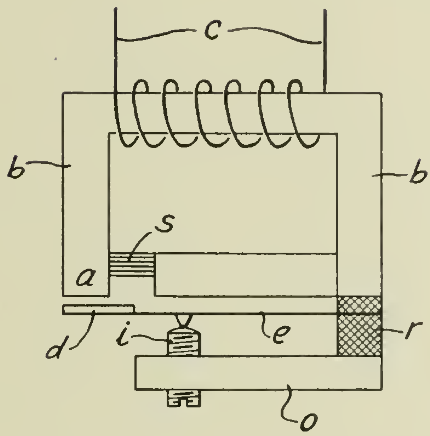

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Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

APPARATUS FOR CONTROLLING, WITH PITCH INDICATOR, THE PITCH VARIATIONS OF PROPELLERS

René Jean Ratie, Montrouge, France; vested in the Alien Property Custodian

Application filed April 11, 1941

The present invention concerns the control of the pitch variations in propellers the pitch of which is variable in flight, of the type in which the blades, pivoting relatively to the hub are coupled by a mechanism controlled by an electric motor the circuit of which, previously closed by the pilot, or by a regulator linked with the working speed of the engine driving the propeller, for effecting a variation of the pitch in one direction or in the other, is automatically cut off when the pitch has reached a determined value.

This electric motor can have two directions of operation or it can have a single direction if a kinematic reverser is caused to intervene. The first case is the most frequently adopted and it is the one which will be contemplated in the following. However, it is to be understood that the invention applies to both cases.

The invention is adapted to combine, in one and the same apparatus of reduced dimensions, the elements indicated hereinafter, which, in known installations, are either distinct or inexistent concerning some of them:

The automatic control of the change of pitch in one direction or in the other;

The hand control of the change of pitch in one direction or in the other;

The independent adjustment of the amplitudes of the change of pitch in both directions;

The pitch indicator.

For that purpose, the apparatus forming the subject-matter of the invention is mainly charactcrised by the combination of three cams:

A cam for automatically breaking the circuit of the motor at the end of the change of pitch in one direction;

A cam for controlling the automatic breaking of the circuit of the motor at the end of the change of pitch in the other direction;

A cam having a double boss, capable of being controlled by hand, and comprising two bosses one of which controls the circuit of the motor for one direction, the other, for the reverse direction; which are all three constantly connected to the engine by planet pinions having a common gyration, the planet pinions of each cam meshing with a distinct sun wheel which allows:

For the two first cams, the adjustment of the point of stoppage of the motor,

For the third cam, the angular displacement of the latter from a member controlled by hand.

In a form of construction of the apparatus above defined in its principle, the three cams are arranged on one and the same shaft mingled with the theoretical axis of the index of the pitch indicator, and the sun wheel controlling the hand cam is connected to the case of the apparatus which constitutes the operating member.

A unit is thus obtained, contained in a cylindrical case the front face of which carries a glass plate through which can be seen the index of the pitch indicator, and the dimensions of which are extremely reduced.

The accompanying drawings illustrate, by way of example only, such a form of construction of the apparatus forming the subject-matter of the invention.

Fig. 1 is a diagram, with illustration in perspective view, of the mechanical arrangement of the apparatus.

Fig. 2 is an electric diagram of the operation of the entire control of the pitch variations.

For facilitating the illustration and the description of the apparatus, the various parts have been arranged by spacing them apart in the axial direction. It can be immediately seen that it is possible to bring them close together to group them into a case of reduced height. Neither the rear plate, nor the lateral wall of said case have been illustrated.

A shaft 1 is arranged according to the theoretical axis of the entire apparatus and journalled at its ends, on the one hand, in the rear plate (not shown) and, on the other hand, in a front plate 2 which, in this embodiment, constitutes the dial of the pitch indicating device. An index 3 rigidly secured on the shaft 1 moves over the dial 2 and it must express, in direction and angular value, the changes of pitch. For that purpose, the shaft 1 is connected, by a flexible connection 4 to the change pitch mechanism. The flexible connection 4 is, in this embodiment, connected by a pinion 5 to the gear 6 fast on shaft 1.

A train comprising:

The pinion 7 fast on shaft 1,

The counter-motion: gear 8—pinion 9,

The gear 10 rigid with the pinion 11 and loosely mounted on shaft 1, connects the latter to two planet pinions 12 freely journalled on a frame diagrammatically illustrated by rods 13.

Said planet pinions 12 in engagement with the central sun wheel 11 mesh with the inner set of teeth of a fixed crown wheel 14, so that the rotation of pinion 11 produces the gyration of the planet pinions 12. This gyration is transmitted, by the frame 13 to groups of planet pinions 15—16—17.

The group 15 meshes with a central sun wheel 18 and with the inner set of teeth of a crown wheel or cam 19.

The group 16 meshes with a central sun wheel 20 and with the inner set of teeth of a cam 21.

The group 17 meshes with a central sun wheel 22 and with the inner set of teeth of a cam 23.

The three sun wheels 18, 20, 22 are loosely mounted on shaft 1. The sun wheel 18 is angularly connected to a hand control member which, in this embodiment, is the front part 24

of the case of the apparatus, said part comprising a glass plate 25 through which can be seen the dial 2 and the index 3 of the indicator. In the diagram, the connection between 18 and 24 is illustrated by an arm 26 and a rod 27 which carries an index 28 arranged in front of the dial 2.

The sun wheels 20 and 22 are respectively connected, by trains of pinions 29—30—31 and 32—33—34, to adjusting rods 35 and 36 displaced, for instance by means of a screw-driver and which can then be locked in the position of adjustment chosen.

The cam 19 (so-called hand cam) comprises two bosses 19^a and 19^b connected by inclines 19^c of neutral position. One of these bosses acts to close a contact at 37, the other to close a contact at 38.

The cams 21 and 23 each comprise only one narrow boss 21^a and 23^a which act to cut off a contact at 39 and at 40. When said bosses are spaced from push-pieces 41 and 42, the contacts 39 and 40 remain closed.

In the electric diagram of Fig. 2, the cams 19—21—23 and the contacts 37—38, 39—40 have been shown as having the same reference numbers as in Fig. 1.

The operation of the apparatus is as follows:

Case of automatic control

This case is that in which the regulator linked with the working speed of the engine intervenes for producing the pitch variations which must allow the engine to resume its optimum working speed when it departs therefrom. If the working speed lowers, the pitch is diminished; if the working speed increases, the pitch is increased.

For putting the electric motor 43 for the change of pitch under the control of the regulator, the pilot acts on the key 53 to close the contacts at 46 and 46^a. If the propeller rotates too rapidly, that is to say if the engine races, the regulator closes the contact at 44—45. A circuit is established through: positive pole of the battery or source of current, contacts 44—45, contact 39, contact 46, winding of relay 48 and negative pole of the source. The relay 48 is energized and closes the contact at 49 which establishes the circuit exciting the motor 43 in the direction for increasing the pitch. This circuit is as follows: negative pole of the source of current, contact 49, inductor 43^a, armature 43 and positive pole of the source of current. The motor 43 rotates in the direction for increasing the pitch of the propeller and drives, by the flexible connection above mentioned, the shaft 4 (Fig. 1) which acts:

1.—Through the medium of pinion 5 and gear 6, to drive shaft 1 which carries the index 3 and indicate to the pilot the direction and the amplitude of the change of pitch.

2.—To drive, through the train 5—6—7—8—10—11 the frame 13 which carries the various planet pinions. The wheels 22 and 20 being stationary, both wheels 21 and 23 are rotatively driven and limit the evolution of the pitch of the propeller between two extreme values. Through the medium of the cam-boss 21^a, the wheel 21 cuts off the contact 39 of the circuit exciting relay 48, this breaking determining the maximum value of the pitch, which value is adjusted by acting on the rod 36, as explained above.

When the regulator acts for reducing the pitch, the contact is closed at 44—45^a and relay 48^a is energized through 40—46^a—47^a. The contact is closed at 49^a and the inductor 43^b is energized. The motor 43 rotates in the direction for reducing the pitch. It is stopped, either by the regulator which cuts off the contact at 44—45^a, or by the cam-boss 23^a which breaks the contact at 40 and determines the minimum value of the pitch.

Case of hand control

If the pilot desires to give to the pitch the entire value he has chosen, he actuates the key 53 so as to close the contacts 51 and 52, the contacts at 46—46^a being cut off. This operation has for effect to put the motor 43 under the control of the contacts 37 and 38.

The pilot then moves the front part of the case 24 to bring the index 28 opposite the point of the graduation of the dial 2 corresponding to the pitch desired. The angular displacement thus effected through the medium of the front part of the case 24 is transmitted to the wheel 19 through the medium of the members 27—26 and the planet pinions 15. If the pilot has indicated on the dial 2, as just explained, a pitch greater than the initial pitch, the contact 38 is closed, which has the effect, as can be seen on the diagram of Fig. 2, of energizing relay 48 and starting the motor 43 in the direction for increasing the pitch. As already explained concerning the automatic change of pitch, the flexible connection at 4 causes wheel 19 to rotate through the medium of the train: 5—6—7—8—9—10—11—12—15. As soon as wheel 19 has resumed its initial position, which occurs when the index 3 has come opposite the index 28, the contact 38 is cut off and the change pitch movement is stopped.

The operation is identical when the pilot desires to pass from a given pitch to a smaller pitch. In this case, the contact 37 is closed and relay 48^a is energized as well as the inductor 43^b.

Any automatic preselecting system intended to determine the optimum pitch can be combined with the hand control which has just been described.

It will be noted that the planet pinions 12—15—16—17 being loosely mounted or freely journalled on the frame 13, the following operations: rotation of knob 35, rotation of knob 36, rotation of dial 24 for the hand control of cam 19, are absolutely independent from and do not affect the gyration of the frame 13. Said gyration occurs only if the pinion 11 rotates, that is to say, if the motor 43 rotates by modifying the setting of the blades.

The apparatus according to the invention, lends itself by its very conception, to the association of the change pitch controls of all the propellers of one and the same multi-engine aeroplane. It suffices to juxtapose on one and the same board several apparatuses such as that described, by kinematically connecting, by means of suitable connections, the automatic and hand control members from one apparatus to the other. For the hand control of the change of pitch, in particular, it suffices for the pilot to act on a single movable dial such as 24 for giving the same pitch to all the propellers.

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PUBLISHED

MAY 18, 1943

BY A. P. C.

R. J. RATIE

APPARATUS FOR CONTROLLING, WITH PITCH INDICATOR, THE PITCH VARIATIONS OF PROPELLERS

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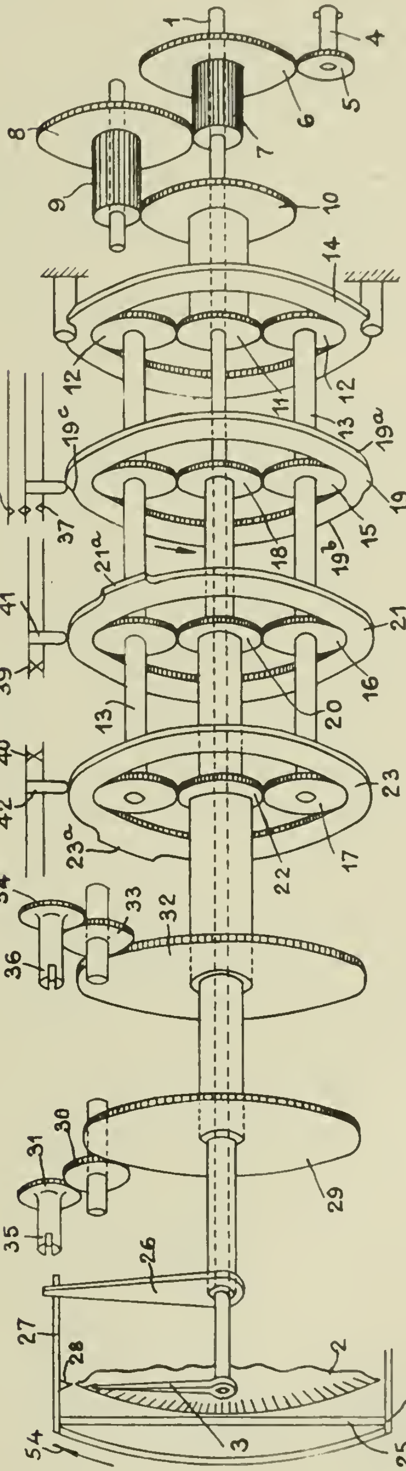
2 Sheets-Sheet 1

FIG. 1.



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2 Sheets-Sheet 2

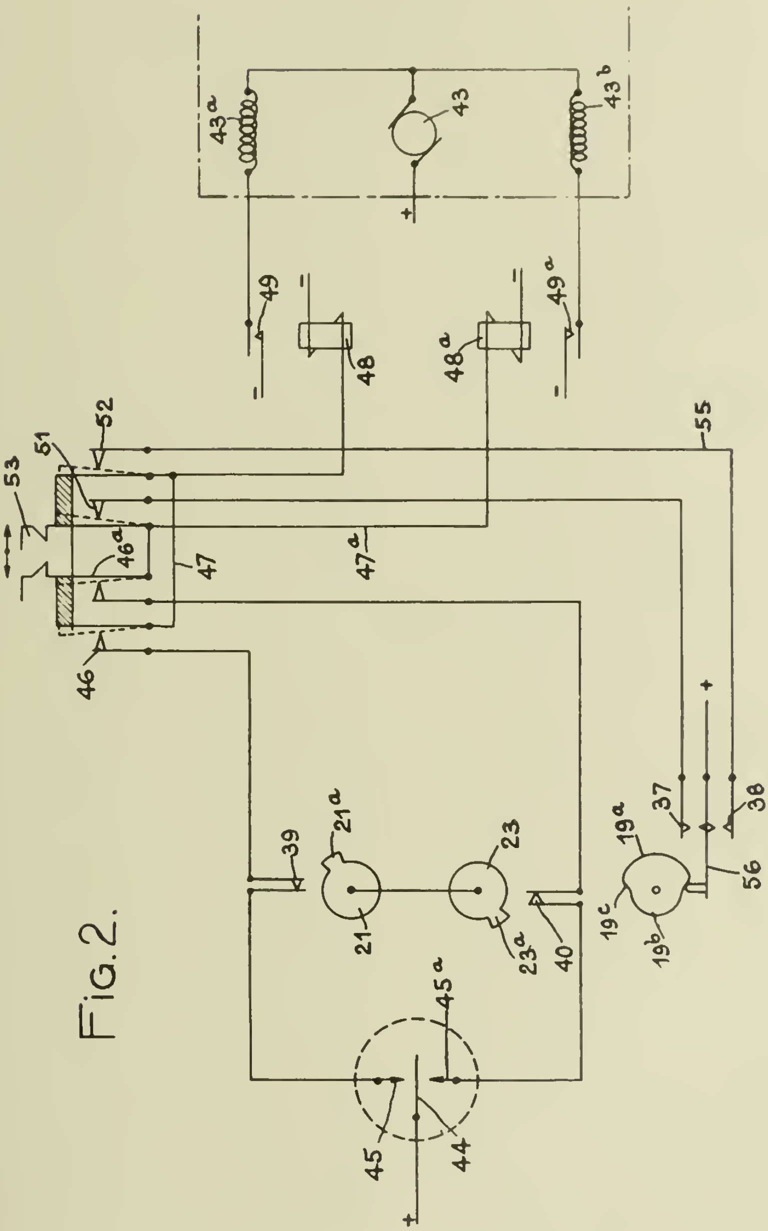

FIG. 2.

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ALIEN PROPERTY CUSTODIAN

ELECTROMAGNETIC DEVICE

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Application filed April 12, 1941

This invention relates to an electro-magnetic device such as a coil or a conductor and has for its purpose to raise the inductance of such a device at frequencies exceeding 10^9 cycles/sec. and more particularly by making use of ferro-magnetic material.

According to the invention this purpose is attained by making use of layers of coherent ferro-magnetic particles applied on to a support.

When measuring the alternating current resistance of thin solid iron wires at high frequencies the magnetic permeability can be calculated from the resistance values obtained. Many investigators ascertained by means of such resistance measurements that the permeability at room temperature at frequencies of several cycles/sec. up to about 10^8 cycles/sec. is constant. Above 10^8 cycles/sec., however, the permeability exhibits a rapid drop of the initial value (for instance 100) to unity. Consequently it is unfeasible to utilise thin iron wires for raising the inductance, for instance of coils designed for frequencies above say 10^9 cycles/sec.

Researches made by us on layers consisting of coherent particles of ferro-magnetic material, which were applied on to a support by means of electrolysis, have proved that the permeability of such layers begins to drop at much higher frequencies than the permeability of thin iron wires, so that such layers may advantageously be used at frequencies above 10^9 cycles/sec.

It is of importance that the layers should be made in such manner that the ferro-magnetic particles of which they are formed stick together so that these layers have a metallic appearance. In a suitable method of manufacture a solution of 50 parts by weight of $FeCl_2$, 50 parts by weight of $CaCl_2$ and 75 parts by weight of distilled water was made to boil and subsequently filtered. After that the electrolysis was effected at a temperature of the bath of about 90° C, a cylindrically curved piece of iron plate of pure iron constituting the anode and a constantan wire, for instance, serving as a cathode. The current density amounted to about 30 mA/cm² on the last-mentioned wire. The constantan wire to be coated was previously treated with a degreasing agent, pickled in diluted hydrochloric acid, washed in distilled water and immediately subjected to the electrolytic treatment. If this method is carried out carefully and as pure as possible solutions are used dense coherent iron layers are obtained which under a metal microscope (with a magnification of about 100) exhibit a metallic appearance which is only slightly different from the surface of solid iron wires. By resistance measurements the specific resistance and its dependency with respect to temperature could be determined from the thickness of the layer also determined microscopically. In this way, also, perfectly coherent layers of pure iron are found.

Iron layers can be precipitated electrolytically also on iron wires, it being advisable that the iron wires to be coated should previously be coppered electrolytically. As an alternative other materials such as constantan and iron, if desired insulated materials, may be used as supports for the layers.

The thickness of the layer must exceed 1.5 microns.

The drawing indicates the initial permeability μ in accordance with the frequency f of an iron layer made in the manner referred to above. Therefrom it appears that the initial permeability up to 10^9 cycles/sec. is substantially constant and then gradually decreases, but at 10^{10} cycles/sec. still has the very high value of about 80.

The wires coated with a layer of precipitated iron particles have an increased inductance and may, for instance, be used in amplifying tubes for short waves in which it is sometimes desirable to increase the inductance of the supply conductors for one or more electrodes of these tubes.

Furthermore layers precipitated on wires or plates may be formed into cores for coils used at frequencies above 10^9 cycles/sec.

It is to be noted that the layers may be made not only of iron, but also of other ferro-magnetic materials such as nickel, iron-nickel and so on.

Instead of applying the layers electrolytically they may also be provided on their supports by cathode disintegration or electrophorese.

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K. S. KNOL ET AL
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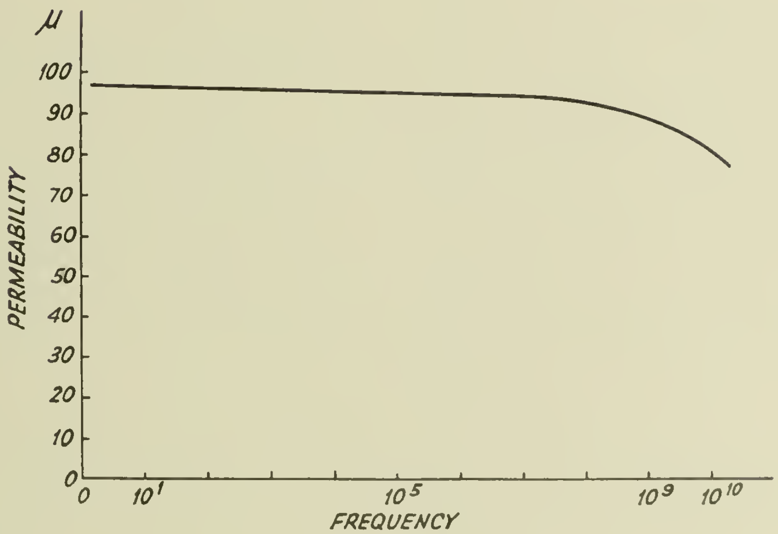

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Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

PURIFIER AND OIL SEPARATING APPARATUS

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Application filed April 16, 1941

This invention relates to a purifier and oil separating apparatus arranged to be inserted in a gas circuit with the object of separating therefrom the liquid particles of oil or the like carried thereby.

Said invention more particularly relates to a purifier of the kind comprising a cylindrical chamber in which the air or other gas to be purified is imparted a whirling motion so that the oil particles settle on the walls of said chamber, flow down said walls and are then discharged by means of a channel connected with the lower part of said chamber, while the air escapes through an outway provided at the upper part of said chamber.

In apparatus of this kind as hitherto in use, the oil discharge channel connects directly, eventually through a valve, with the inner chamber of the purifier. This arrangement, though not impairing the operation when the pressure in this discharge channel is substantially lower than that obtaining in said chamber, is however disadvantageous when the oil is to be discharged into a sump or reservoir the pressure in which is practically the same as or even greater than that obtaining in the purifier. In this case, the discharge of oil will not be properly effected, and the back-pressure in the discharge channel impairs the operation of the apparatus as a whole and impedes the flow of the oil.

One object of this invention is to provide a purifying and oil separating apparatus of the aforementioned type, which is able to operate properly even when the oil is to be discharged into a sump or reservoir the pressure in which is equal to or higher than that of the gas to be purified. Another object is to provide a purifier more particularly though not solely adapted to be used in plants on board of aircraft in which the separated oil is to be returned to the crank case of the engine or to a sump or reservoir connected with said crank case; a still further object is to provide a purifier of the aforesaid kind which may conveniently form the connection between the crank case of an engine and the open air so as to act as a snuffle valve.

In accordance with an important feature of the invention, the connection between the inner chamber of the purifier and the oil discharge channel is effected through a separating device or extractor. In a preferred embodiment, this extractor is in the form of a cylindrical body the outer side wall of which is provided with a spiral groove and is fitted to turn in a cylinder.

This extractor acts as a pump and effects the positive discharge of the separated oil by forcibly driving same into the discharge channel, even when acting against a substantial back-pressure.

In another embodiment, the said cylindrical body is hollow and its side wall is provided with ducts opening into said groove, the oil to be discharged being delivered into said body. The oil is thus centrifugally driven through said ducts. This centrifugal separator or extractor may also serve as a purifier if, according to another feature of the invention, the gases to be purified are so delivered into said cylindrical body that they circulate therethrough, the oil particles in suspension thus being centrifugally separated in the cylindrical body itself and thrown upon its peripherical wall from which they are discharged by said ducts.

The purifier according to this embodiment may be constructed as an independent assembly driven by a prime mover—electric or otherwise—or the aforesaid rotor in accordance to a preferred embodiment may be arranged in the crank case of a combustion engine and driven by a driving connection from the engine shaft.

Another object of the invention is to remove as completely as possible the oil particles that may settle upon the walls of the outlet of the purifier, which outlet may be conveniently provided with an inner screw thread the hand of which is in the opposite direction to that of the whirl formed by the air in the purifier.

In view of this object, in accordance with an important feature of this invention, also usable independently of the features above described, the wall of the aforesaid outlet is provided with a tangential passage turned in the same direction as the whirling motion and opening into a small chamber from which the oil is discharged by a conduit connected with a suction means.

In a convenient embodiment the discharge conduit of the aforesaid small chamber is connected to the oil extractor already described.

The oil contained in the small chamber is thus sucked by the aforesaid extractor acting as a pump or the like and is discharged together with the oil that has been separated in the body of the purifier.

Other objects and features of the invention will be apparent from the following description given with reference to the annexed drawing and more particularly pointed out in the claims.

In the drawing are shown only by way of examples:

Fig. 1, a sectional elevation of a purifier according to an embodiment of this invention;

Fig. 2, a fragmentary perspective view of a modification;

Fig. 3, a sectional elevation of a purifier according to another embodiment, acting as a snuffle valve for a combustion engine;

Fig. 4, a fragmentary plan view of the rotor of the purifier shown in Fig. 3.

According to the embodiment shown in Fig. 1, the purifier comprises a vertically arranged hollow body **1** having inside a cylindrical chamber **2** into which tangentially opens an inlet passage **3** for the air or other gas to be purified, said passage slightly slanting downwards. The inner wall of chamber **2** is faced with a wire gauze or sieve **5** carried by a dome **6** which rests upon an upwardly facing shoulder **7** carried by the lower part of said chamber, said dome **6** being provided with peripherical gaps **9**. Below the shoulder **7** the chamber **2** is funnel-like and leads to a discharging duct **10**. The latter opens into a cylindrical sleeve **12** carried by the body **1** and closed by a cap **13**. The sleeve **12** serves as a casing for a worm **15**, a space **16** being provided between the end of the threaded part of said worm and the bottom of said casing. The duct **10** and a passage **17** leading to a drain-off conduit **18** respectively open into the casing on both sides of said threaded part. The worm **15** ends into a spindle **20** mounted in a bearing and projecting outwardly. Said spindle **20** is provided with a catch pin **22** for coupling same with the shaft of an electric motor **24** so that said spindle may be rotatingly driven thereby.

The chamber **2** is closed at its upper part by a cover **25** having centrally a cylindrical outlet **26** through which the purified air is to be discharged, said outlet being surmounted by a cap **27** provided with a wire gauze. The outlet **26** is provided with an inner screw-thread the hand of which is in an opposite direction to the gyrating motion imparted to the air entering through the passage **3**. A slanting duct **30**, opening tangentially into the outlet **26**, connects the latter with a chamber **31** formed in the cover **25**, said chamber being closed by a plug **32**. The bottom of this chamber **31** inclines towards an outlet passage **34** leading to the aforesaid space **16** at the right end of worm **15** (as shown in Fig. 1) in casing **12**.

The air or the like entering into the chamber **2** through the passage **3** causes a downward whirling flow along the cylindrical wall of said chamber, and the particles of oil carried in suspension are retained by the wire gauze **5** and flow upon the dome **6**, being then directed through the holes **9** and the passage **10** to the casing **12**, from which they are removed by the worm **15** driven by the motor **24**, so that they are forcibly driven into the conduit **18** even if a back pressure obtains in said conduit, as is the case, for example, when said conduit leads to the crank case of a combustion engine to the snuffle valve of which the passage **3** may be connected.

The purified air escapes through the outlet **26**. The oil particles which may still be carried in suspension therein settle on the wall of said outlet and return to the chamber **2** by flowing along the thread of said outlet. The last particles flow through the duct **30** into the small chamber **31** from which they are drawn off, by the relative vacuum or suction caused by the pump consisting of the worm **15** and the casing **12**, through the passage **34**, into said casing, to be directed therefrom by conduit **18**.

In the modification shown in Fig. 2, the channel **30** opens into a small chamber **31**. A Pitot's tube **38** arranged vertically and opening opposite to the gas inlet **3** assures the discharge from said chamber **31** and produces therein a slight suction.

Figs. 3 and 4 relate to a purifier the body **1** of which is secured in the crank case **39** of a combustion engine and has a cylindrical chamber **2** closed by a cover **25** provided with holes **40—41**. This body contains a rotor integrally connected with a spindle **46** mounted in roll bearings **48, 49** carried respectively by the body **1** and the cover **25**. The lower end of said spindle is integrally connected with a pinion gear **50** engaging with a pinion gear **51** driven from the engine shaft. The rotor is in the shape of a cup. The bottom **53** thereof is provided with holes **55** and webs **56** are provided between the spindle **46** and the annular wall **59** of said rotor. The latter is provided with radial holes extending throughout its annular wall **59** and its outer surface is provided with a spiral web **61** substantially engaging with the cylindrical inner wall of the chamber **2** of the purifier. The web **61** is provided with a screw-thread the hand of which is such that the rotation of the rotor forces oil downwardly. Opposite to the peripherical rim of the bottom **53** is an annular groove **62** connecting through a channel **10** with the inside of the crank case. A channel **3** opens into the lower part of the chamber **2** and delivers air charged with oil particles. This air is admitted by the holes **55** in the rotor, by which it is centrifugally separated. The oil particles flow through the holes of the wall **59**, and the webs **61** drive the oil into the groove **62**, from which it falls back into the crank case through the channel **10** against the action of the back pressure. The purified air is discharged through the holes **40, 41**.

The invention obviously is in nowise limited to the embodiments shown and described by way of examples. Thus particularly the purifier according to Figs. 3 and 4 may be constructed in the form of an independent assembly and driven by an electrical or other motor.

CHARLES RAYMOND WASEIGE.

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C. R. WASEIGE
PURIFIER AND OIL SEPARATING APPARATUS
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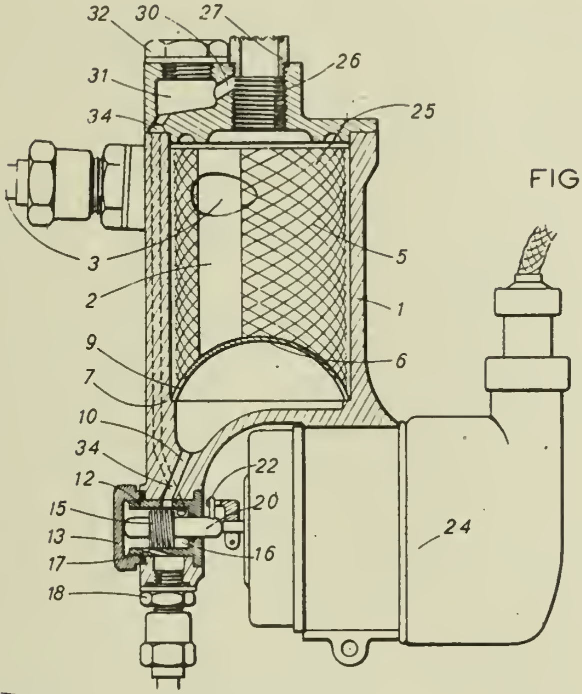


FIG. 1

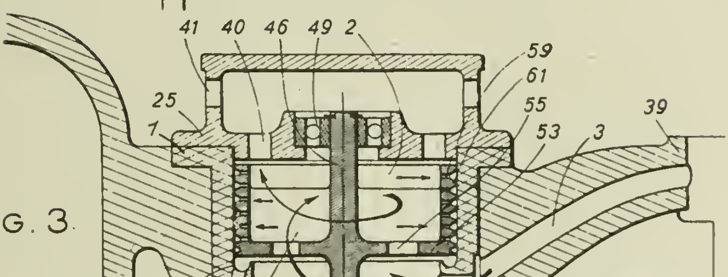


FIG. 3

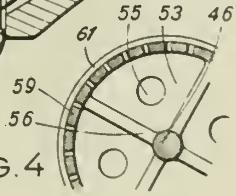
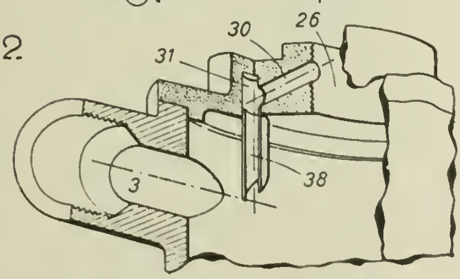


FIG. 4

FIG. 2



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ALIEN PROPERTY CUSTODIAN

AUTOMATIC AIRCRAFT STEERING DEVICE

Adam Kronenberger and Fritz E. Bartelt, Berlin, Germany; vested in the Alien Property Custodian

Application filed April 17, 1941

This invention relates to an automatic aircraft steering device with electrically transmitted steering impulses. Generally, with such arrangements, gyroscopic devices are used as steering impulse generators for preventing deviation of the aircraft from its correct attitude. Besides the impulses caused by change of attitude or position, other steering impulses are used depending upon the angular velocity and sometimes also upon the angular accelerations of the craft. In order to obtain most favorable steering action, the impulses have to be correctly balanced in magnitude. In particular, it is necessary that the impulse actually controlling the course must not exceed certain limits. On the other hand, it is also desirable to employ this steering impulse for controlling an indicator. For the purpose of steering, the full range of deflection must be limited to a relatively small angle, whereas the range of the course indicator must comprise a considerably larger angular range up to 10° or even 30°. Both requirements are fulfilled according to the present invention by inserting saturable reactor system between the electric steering impulse generator and the power relay which operates the aircraft control surface or surfaces. The saturable reactor system is designed as an amplifying choke and so biased magnetically that the portion of the steering impulse to be used for controlling the course is reduced to the desired limit due to saturation of the magnetic system. Thus, the steering impulse actually transmitted to the power relay is reduced to the magnitude required for automatic steering and only a predetermined maximum value can be effective for changing the course in response to changes in the base line. At the same time, a counter impulse, controlled by the angular velocity of the craft, is employed for opposing the normal steering impulse.

In general, both positive and negative steering values are transmitted. This can be accomplished by using two choke systems, one of which transmits positive values, while the other transmits negative values. The power relay may then be designed as a device which responds to the differences or the ratios of the impulses. For example, a moving coil instrument with two opposed windings may be used.

In order to superimpose upon the course steering impulses the signals obtained from the angular velocity and the angular acceleration, it is proposed to use an amplifying choke provided with a plurality of control windings which receive the different signals, the output of said amplifying choke being proportional to the sum of all the impulses.

The drawing shows an automatic course steering device designed according to the invention.

Reference numeral **1** shows schematically a rotor of a directional gyro which spins around a horizontal axis in the rotor bearing frame **2**. The rotor bearing frame is pivoted around another horizontal axis in the gimbal frame **3**. On the frame **3**, which can oscillate around a vertical axis **4**, a sliding contact **5** is mounted which glides over the winding of a potentiometer **6**. This potentiometer forms one branch of a Wheatstone bridge, the other branch of which is formed by two equal fixed resistors **7** and **8**. Direct current is supplied to the bridge by a battery **9** to the points **5** and **10**, causing a differential potential between points **11** and **12** as soon as contact **5** moves way from its means position. Depending upon the direction of the current, which in turn depends upon the sign of the course deviation of the aircraft, the current which is adjusted by a rheostat **13**, flows through one or the other of the control windings **14** and **15** of two amplifying chokes **16** and **17** through the associated rectifiers **18** or **19**. A moving coil indicator **20** is also connected across the bridge, serving as a course indicator for the gyro. The chokes **16** and **17** have two bias windings **21** and **22** which are connected through adjustable rheostats **23** and **24** and a full-wave rectifier **25** to the winding **27** of a transformer **26** supplied with 500 cycle A. C. The full output of the chokes **16** and **17** is obtained more quickly as the bias magnetization is raised. Preferably the control range is limited to about 2° of course change while the range of the potentiometer **5** and **6** extends over more than 20°, thereby supplying a proportionally higher current to the course indicator **20**, giving an indication of the total course deviation.

On its output side, the amplifying system **16** and **17** is connected to another similar amplifying choke system **34** and **35** by having its windings **28** and **29** connected through rectifiers **30** and **31** and rheostats **32** and **33** to the windings **36** and **37**. The first system obtains its supply from a winding **26***a* of transformer **26** while the second system is supplied by a winding **38**.

Besides the control windings **36** and **37**, the chokes **34** and **35** have two additional control windings **39** and **40**. The current flowing through these windings depends upon the position of an armature **41** which is controlled by a restrained gyro **42**. This gyro is mounted in a bearing frame **43**, which in turn is carried by a gimbal

frame 44. Both the rotor bearing frame and the gimbal frame are restrained to their mean position in the usual way, not shown in the drawing. The rotor bearing frame has a weak restraining force while the gimbal frame is strongly restrained, so that only small deviations around the vertical axis 45 of the gimbal frame can be obtained. Such a gyro gives a steering impulse which is equal to the sum of the angular velocity and the angular acceleration of the aircraft. Depending upon the position of the armature 41 between the two coils 46 and 47, their magnetic resistance and thereby their self-induction is changed. Accordingly, the potential supplied from the transformer windings 48 encounters different resistances, so that in the windings 39 and 40 of the chokes 34 and 35, currents of different magnitude flow, passing through the rectifiers 48 and 49. By using the bias windings 50 and 51 which are also provided for this amplifying system and which are adjustable by means of rheostats 52 and 53, and a full wave rectifier 54 supplied by a winding 55 of transformer 26, it is possible to adjust the most efficient working point on the characteristic of the amplifier.

The steering impulses obtained from gyro 42 and from gyro 1 are super-imposed and commonly amplified in the chokes 34 and 35, and then introduced into the windings 56 and 57 of a direction sensitive torque motor 58. This torque motor controls the seesaw lever 59 of a hydraulic rudder motor system. Two small pistons 60 and 61 are attached to the seesaw and are adapted to alternately increase or decrease the cross section of ports 62 and 63 which are supplied with circulating pressure oil from an electrically driven three-wheel oil pump 64. As soon as the seesaw inclines to one side, one port will be throttled so that a higher pressure appears in the associated control pipe 65 or 66 respectively, whereby the work piston 67 is set in motion to cause an angular movement of the rudder 68.

The action of the steering device is as follows: while flying straight the windings 14 and 15 of the choke 16 and 17 carry no current. The idle current coming from the coils 28 and 29 is carried through windings 36 and 37 to the two amplifying chokes 34 and 35 and is super-imposed upon the current flowing through the winding 39 and 40. Both currents are equal and opposite as the contact 5 and armature 41 are in their mean position, thereby neutralizing each other. The rheostats 52 and 53 in the bias circuit are so adjusted that the chokes 34 and 35 are approximately 50% saturated when everything is in neutral. The currents issuing from the two branches of the amplifier into the windings 56 and 57 of the torque motor 58 are without effect as long as contact 5 and armature 41 remain in their mean positions. The ports 62 and 63 therefore allow equal amounts of oil to pass and no differential pressure is acting upon the piston 67 and rudder 68 respectively.

If the aircraft is thrown off course by wind, gyro 42 precesses according to the angular velocity and angular acceleration of the craft. Furthermore, a relative motion occurs between the potentiometer contact 5 of the gyro 1 and the resistance element 6 proportional to the course deviation.

The arrow 69 may show the direction of the current flowing from battery 9 and may also show the direction of flight. Furthermore, it is assumed that the aircraft is thrown off course to the right. The relative motion of the directional gyro therefore is towards the left. Also gyro 42, which may be considered as a mass of high inertia, lags behind the aircraft in the same sense. The contact 5, which is controlled by gyro 1, is displaced towards the top so that the resistance in the lower branch of the bridge increases. This increases the potential at the point 12 and current starts to flow from 12 through the rectifier 18 and the winding 14 of the choke 16, and from there through resistance 13 to point 11 of the bridge. This increases the output current of choke 16 whereby the current through the winding 37 of the choke 35 is increased while the current flowing through winding 36 of choke 34 remains unchanged. On the other hand, the movement of armature 41 of gyro 42 in counterclockwise direction causes a decrease of magnetic flux in winding 47 so that the inductive resistance of this winding decreases and a higher current is flowing through the control winding 40 of choke 35 in the same sense as the current caused by gyro 1 through winding 37. As the motion of armature 41 simultaneously causes an increase of the inductive resistance of winding 46 the current flowing through control winding 39 of choke 34 decreases. The output current of choke 34 thus decreases while the current supplied to choke 35 increases in accordance with deviation, angular velocity and angular acceleration of the aircraft. The current in coil 57 of the torque magnet 58 therefore is higher than the one in 56 thereby causing a corresponding motion of the seesaw 59 in counter-lockwise direction. This tends to close port 62 and to increase pressure in pipe 65, forcing the work piston 67 to move downward. This in turn causes a deviation of the rudder to the left whereby the aircraft is returned to its original course. In order to be able to cause a change of course, the course base of the course gyro is adjustable in known manner. The resistance element 6 is mounted on a gear sector 70 which by means of a handwheel 71 and a worm 72 can be turned around the same axis 4 as the gimbal frame of gyro 1. Coupled to this gear drive is a course dial 73. The two ends of the resistance element 6 are connected to contact segments 74 and 75 in order to prevent interruption of contact even if handwheel 71 is turned very fast.

If it is intended to change course 30° to the left, the gear sector 70 is turned through 30° in right hand sense by means of handwheel 71 and the new course is indicated on dial 73. The aircraft now turns towards the left in order to re-establish the original mean position of contact 5 on the resistance element 6. The angular velocity obtained depends upon the magnitude of the course impulse with respect to the angular velocity impulse obtained from gyro 42 which opposes the turning motion of the aircraft. While the change of the base line may be accomplished in a few seconds, the aircraft needs 15 seconds if the adjusted angular velocity is 2° per second. This results in a course impulse which, for a considerable time, is far greater than the value necessary to maintain the aircraft on its course during straight flight, and which would not be able to hold its own against the angular velocity impulse if both were introduced into the chokes 34 and 35 in parallel. The chokes 16 and 17, which, according to the invention, are introduced into the course impulse circuit, limit the amount of the course impulse by cutting off the peak of the steering impulse. This is accomplished by obtaining saturation long before the maximum

steering impulse has been reached. The indicator **20**, however, receives the full value steering impulse so that, especially when steering by hand, the amount of deviation of the aircraft from the desired course can be read over a relatively wide angular range.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

ADAM KRONENBERGER.
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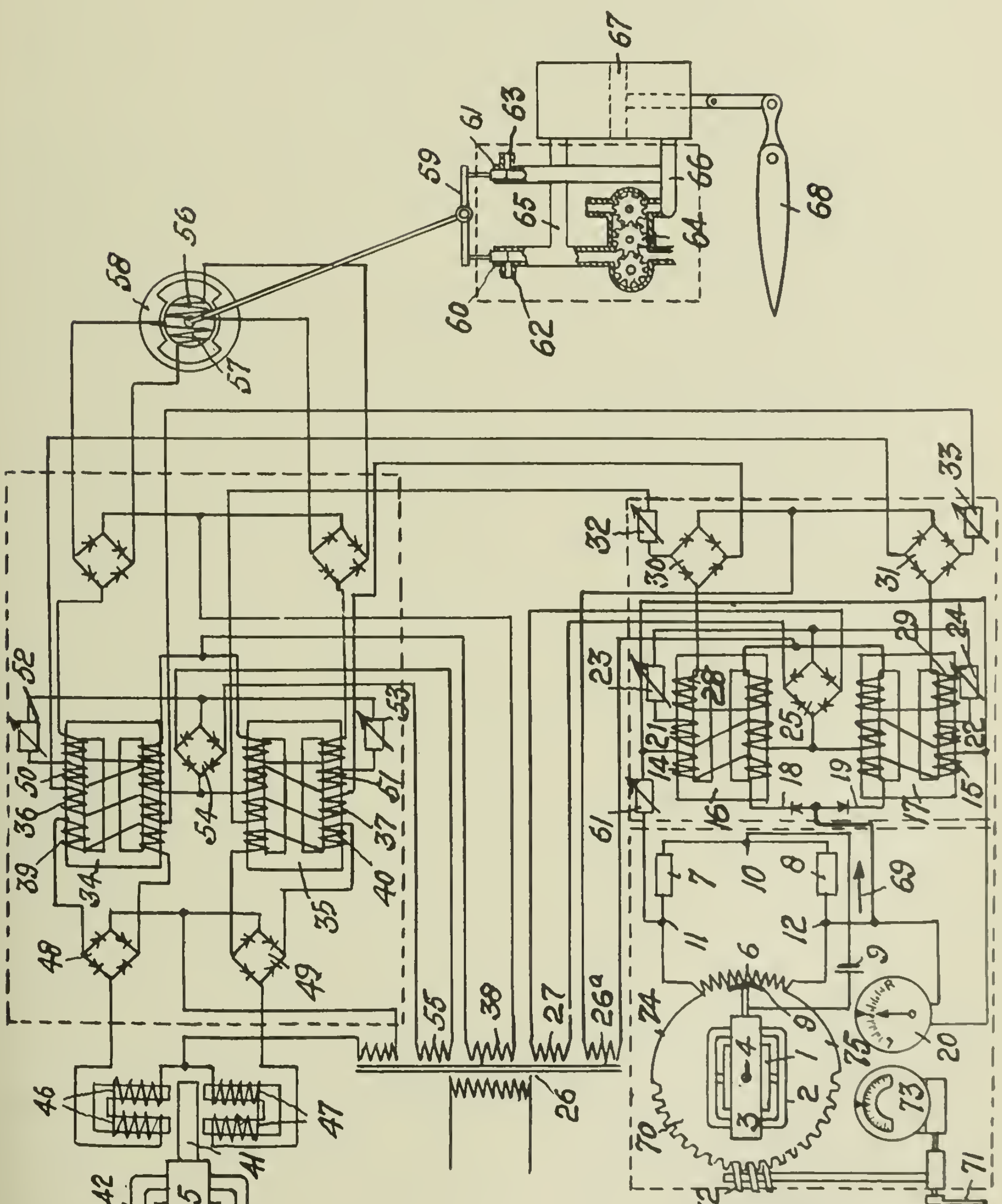

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ALIEN PROPERTY CUSTODIAN

CATALYTIC REACTIONS WITH CARBONACEOUS MATERIALS

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No Drawing. Application filed April 17, 1941

The present invention relates to a process of carrying out catalytic reactions with carbonaceous materials.

This application is a continuation-in-part to our application Ser. No. 321,210, filed February 28, 1940.

In carrying out catalytic reactions with carbonaceous materials at an elevated temperature, for example above 200° C. and more, particularly above 300° C., for example in the cracking of hydrocarbon oils or in the destructive hydrogenation of coals, tars and mineral oils it is known to use porous catalysts or porous materials as carriers for catalytic substances. Solid gels of silicic acid or silicates, in particular, have already been used for this purpose either alone or in combination with one or more metal compounds, preferably alumina. Such gels are generally distinguished by having pores of ultramicroscopic fineness. The pores of a given gel, however, are but rarely uniform in diameter; most gels rather possess pores of most diverse diameter varying for example between 0 and 50 $\mu\mu$ and above; part of the pores often exceeds even ultramicroscopic dimensions, depending on the conditions under which the gels were made. For catalytic purposes large-pored gels are usually preferred, i. e. gels the active pore volume of which is predominantly made up of pores, for example to the extent of 80 to 90 per cent, the diameter of which spreads over a range of between 2 and 43 $\mu\mu$ because such gels are especially well suited for absorbing solutions of substances having a catalytic action. The gel-like catalysts and carrier masses hitherto used in catalytic reactions with carbonaceous substances, however, left much to be desired in efficiency, as no considerations were known which might be a guide in choosing the porous masses.

We have now found that, in practicing catalytic reactions with carbonaceous materials, especially in the refining, aromatizing or destructive hydrogenation of coals, tars and mineral oils, in particular also of middle oils obtained by destructive hydrogenation or from carbon monoxide and hydrogen, excellent yields are obtained, if such porous catalysts or carrier masses be used in which at least 30 per cent, preferably at least 50 per cent and most advantageously from 60 to 85 percent, of the active pore volume consist of pores of a diameter of between 0 and 2 $\mu\mu$; particularly good results are obtained if at least 15 per cent, preferably at least 25 per cent and most advantageously from 30 to 60 per cent, of the active pore volume consist of pores of a diameter of between 0 and 1 $\mu\mu$.

It means already a great advantage if only the carrier mass of the catalyst, i. e. the skeleton left after dissolving out therefrom any additional catalytic materials, for example metal oxides, satisfies the above conditions, but even better results are usually obtained if the finished catalyst, i. e. the carrier inclusive of the catalytic substance, satisfies the conditions. For brevity's sake the term "catalyst" is henceforth meant to cover both the finished catalyst and the carrier for the catalytic substance.

Investigations into the pore diameter of a material are preferably carried out by the Kubelka method (see "Kolloid Zeitschrift", vol. 55, 1931, page 129 et seq.) but a complete adsorption isotherme need not be made out. It rather suffices to ascertain the adsorption power of the porous mass towards benzene vapor from a hydrogen current at 18° or 20° C. which at these temperatures possesses a relative saturation with benzene vapor of 1 per cent, 10 per cent and 90 per cent, respectively, which degrees of saturation, according to Kubelka's formula

$$D=\frac{B.\cos\phi}{-\log S}$$

(loc. cit., page 136 (5)) are known to correspond to pore diameters up to 1 $\mu\mu$, 2 $\mu\mu$ and 43 $\mu\mu$, respectively. In this formula D means the pore diameter in $\mu\mu$, S means the relative degree of saturation of the benzene vapor, B means a constant (1.87), and cos ϕ is equal to 1 for benzene according to Kubelka, (loc. cit., page 137, table XII).

The adsorption power for the different degrees of saturation is ascertained by determining (see Kubelka, loc. cit., pages 130/131) the increase in weight of the gel over which hydrogen with a relative saturation in benzene vapor of 1 per cent, 10 per cent and 90 per cent, respectively, is passed. The increase in weight is equal to the quantity of benzene adsorbed in the pores which, when divided by the specific gravity of benzene, indicates the pore volume corresponding to the above degrees of saturation.

The pore volume calculated from the adsorption power at a relative saturation of 90 per cent has been denoted herein as the "active pore volume", the "inactive pore volume" which exists in addition thereto and which only becomes obvious in the adsorption at a relative saturation of more than 90 per cent being ignored.

From among the numerous kinds of silica gels

the fine-pored ones only come into consideration; they are advantageously made according to the processes of the German Patents Nos. 574,721 and 626,272. In making the said gels it is of high importance first to prepare a weakly acid homogeneous sol, preferably one with a pH-value of between 2 and 5, preferably between 3 and 4.5, to form a jelly by allowing the sol to solidify and then, when washing the said jelly for a far-going removal of the salts formed during the sol-formation, to set up therein a pH-value of between 2 and 6, more preferably between 3 and 5. On drying the pieces of jelly then shrink into solid granules of porous gel, the pore volume of which spreads over the said range of diameters in the ratio indicated.

Another procedure consists in setting up in the silica jelly or silica-alumina jelly, precipitated in the presence of an acid, a pH-value inferior to 2, preferably between 1 and 2, the drying, by which the shrinking or formation of pores is to be accomplished, being carried not too far, but at the most to a content of water of from 20 to 40 per cent, removing part of the acid from the partially shrunk mass by a second washing until a pH-value of between 2 and 6, preferably between 3 and 5 has been set up, and then drying again. This method is the more preferred the more the pH-value is inferior to 2; for, if the water contained in the pure jelly or the jelly containing salts be completely replaced by concentrated sulphuric acid and the pore-formation be accomplished by complete shrinkage, fine-pored gels, which are suitable for use in the present process, would not result. The pH-value most suitable within the range of between 3 and 5 may be set up by removing acid from a jelly of stronger acidity or adding acid or acid media to a more weakly acid or neutral or only weakly alkaline jelly, preferably while this is being washed. The jelly consisting of silica gel or silica gel and some aluminum hydroxide or the waste jelly available in the form of small pieces may be shaped into cylinders or Raschig rings, preferably by means of an extrusion press, as described for instance in the German Patent No. 544,868, Example 1.

As a matter of course, the above directions not only apply to gels obtained by way of a sol, but also to precipitates and inhomogeneous jellies, in the manufacture of which an alkaline or extremely acid reaction is preferably avoided and a weakly acid reaction is maintained, provided these substances are brought to shrink at the said pH-value, preferably a pH-value of between 3 and 5. For the reason, however, that hard and coarse lumps are usually not obtained thereby, these precipitates or products obtained by drying the same must likewise be shaped in an extrusion or tabletting press, preferably according to the methods disclosed in the U. S. Patents Nos. 1,751,955 and 1,832,153 or, after homogenization by a severe mechanical treatment, as disclosed in German Patents Nos. 557,337 and 542,321.

The pure gels, as also those which contain metal oxides, may be laden, for example with metal compounds, such as for example aluminum salts or colloidal solutions of alumina by subsequently treating them in known manner, for example by impregnation or, as described in the U. S. Patent No. 1,832,153, by shaping; suitable substances may also be incorporated in the mass already during the manufacture thereof, for example according to U. S. Patent No. 1,797,804 and German Patent No. 617,593. Among catalytic additions to the silica sol or silica gel which, if desired, may contain alumina, we may mention above all the catalytic substances already known for the purposes in question, for example, for use, in cracking, compounds of aluminum, boron, magnesium, beryllium or manganese and, for use in destructive hydrogenation, heavy metal sulphides or oxides, especially those of the metals of the sixth and eighth group of the periodic system, for example of molybdenum, tungsten, chromium and cobalt.

The catalysts may be further improved by subjecting them to an after-treatment by thorough washing or acid treatment. An acid treatment, which according to its intensity results in a partial or complete removal of metal oxides or other soluble substances contained in the mass or in a partial lading of the pores with small proportions of acid (sulphuric, hydrochloric, nitric or phosphoric acid), is followed equally by a thorough washing with distilled water and a drying, so that the final product is neutral or but extremely weakly acid.

For use as catalysts we may mention also synthetic bleaching earths or gels of the composition of synthetic bleaching earths or the thoroughly washed waste materials, so-called "Si-materials" containing hydrated silica and alumina and which result in the decomposition of minerals, earths, slags, or clays by means of acids, as for example sulphuric acid, hydrochloric acid, nitric acid or sulphurous acid, or the gels prepared therefrom, provided the pores of these materials have their diameters spread over the range of diameters above referred to.

The fine-pored catalyst according to the present invention is intended for use in the destructive hydrogenation of carbonaceous materials, especially middle oils, under pressures up to 1000 atmospheres and more, especially from 250 to 750 atmospheres. The catalysts employed above 250 atmospheres, in particular above 300 atmospheres, advantageously may only contain silica, alumina and/or magnesia, but no other hydrogenating metal compounds, whereas the catalysts employed with pressures of from 20 to 250 atmospheres, more particularly from 50 to 250 atmospheres, advantageously may contain also heavy metal sulphides, especially sulphides of molybdenum, tungsten, iron, nickel and cobalt.

The following example serves to illustrate how the present invention may be carried out in practice, but the invention is not restricted to the said example. The percentages and parts are by weight.

Example

100 grams of a fine-pored silica gel obtained by allowing a homogeneous sol (pH 3 to 4.5) to solidify, washing the jelly so obtained until a pH of between 3 and 5 has been reached and drying the jelly at from 200° to 300° C., the active pore volume of which gel consists of 35 per cent of pores with a diameter of between 0 and 1 $\mu\mu$ of 35 per cent of pores with a diameter of between 1 and 2 $\mu\mu$ and of 30 per cent of pores with a diameter of between 2 and 43 $\mu\mu$, i. e. of 70 per cent of pores with a diameter of between 0 and 2 $\mu\mu$, is saturated with water vapor, gradually soaked with a solution of 8 grams of aluminum nitrate ($Al(No_3)_3.9H_2O$) in 50 cubic centimeters of water and dried at from 120° to 180° C. The dry gel is then impregnated with an aqueous solution of ammonium thiotungstate of 10 per cent strength which contains

an excess of ammonium sulphide. The mass is then dried in the absence of air and put into a reaction tube and heated up to 400° C. while passing through hydrogen. The catalyst which then consists of silica-alumina gel containing 10 per cent of tungsten sulphide is then used in the destructive hydrogenation of a paraffin base gas oil boiling between 210° and 350° C. under a hydrogen pressure of 200 atmospheres at 400° C. with a throughput of 2 kilograms per liter of catalyst and per hour. The product obtained contains 62 per cent of gasoline with an octane number of 75.

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ALIEN PROPERTY CUSTODIAN

ELECTROLYTIC CONDENSERS

Werner Herrmann, Kleinmachnow, Germany; vested in the Alien Property Custodian

Application filed April 19, 1941

This invention relates to improvements in electrolytic condensers.

Electrolytic condensers made of metallized paper are well known in the art. The metallized paper employed in electrolytic condensers is manufactured by the spraying method or galvanic method. It has also already been proposed to employ metal foils applied to paper for the manufacture of an electrolytic condenser, particularly of a roll type condenser.

The object of the present invention is to provide an electrolytic condenser, in which upon the occurrence of a momentary excess voltage the metal layer of at least one of the electrodes continues to burn at the breakdown point in order to render again operative the condenser and to avoid a permanent short-circuit by the metallic contact of both electrodes.

In contradistinction to the condensers hitherto known a very thin metal layer is applied to the spacer according to the invention, preferably by evaporating the metal. In this case the spacer consists substantially of paper. However, also other known spacers, for instance, of Cellophane or the like may be employed. By evaporating the metal such a thin layer is obtained as to actually ensure a continuous burning of this metal layer.

The anode of an electrolytic condenser, i. e., that electrode which is covered with an insulating layer is as is well known subjected to a forming process consisting of one or more steps. Owing to this treatment it is not advantageous to manufacture this anode of this metallized paper, but the bare cathode which is, as a rule, not subjected to any particular forming or edging process is made according to the invention preferably of metallized paper.

The electrode of an electrolytic condenser consists, in general, of aluminum. However, it is also possible to employ for the electrode, particularly for the cathode to which the metal is applied by evaporation, other metals which are easier to fuse and to evaporate, such as, for instance, zinc.

In the accompanying drawing is shown an embodiment of the invention in diagrammatic form, which represents an enlarged cross-section of the electrodes employed. **1** denotes the so-called anode provided with an insulating layer. **2** denotes a paper band on which the metallic layer **3** serving as a cathode is applied by evaporation. As a spacer **2** an absorbing paper of the thickness of 20–150 *u* is employed as is usual for the manufacture of electrolytic condensers. **3** is preferably an aluminum or zinc layer of a thickness amounting to a fraction of *u*.

In manufacturing a roll type body another strip of paper is applied to this metal layer **3** or a strip of paper **5** to which the same metal layer **4** is applied by evaporation. In this manner a particularly intimate contact of the electrolyte to be placed between the spacers **2** and **5** is obtained with the cathode coatings **3** and **4**.

The parts **1**, **2** and **3**, **4** and **5** are wound in the usual manner. Instead of a roll type condenser, also corresponding condensers of the plate type may be manufactured according to the invention. The other manufacturing steps of the condenser, such as impregnation, use of an electrolyte, ageing etc. are effected in the usual manner.

To render the condenser sufficiently puncture-proof before being used it may be when being manufactured subjected to excess voltages. In this manner very weak points of the spacer or of the oxide layer are avoided, since at these points the metallic layer is fused during the manufacture of the condenser.

The cathode coatings are removed according to the invention at the weak points of the oxide layer, so that a longer current path is obtained through the spacer, which path corresponds to a higher voltage.

To produce the layer to be applied by evaporation to the spacer any known methods such as the vacuum method, continuous method etc. may be employed.

WERNER HERRMANN.

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BY A. P. C.

W. HERRMANN
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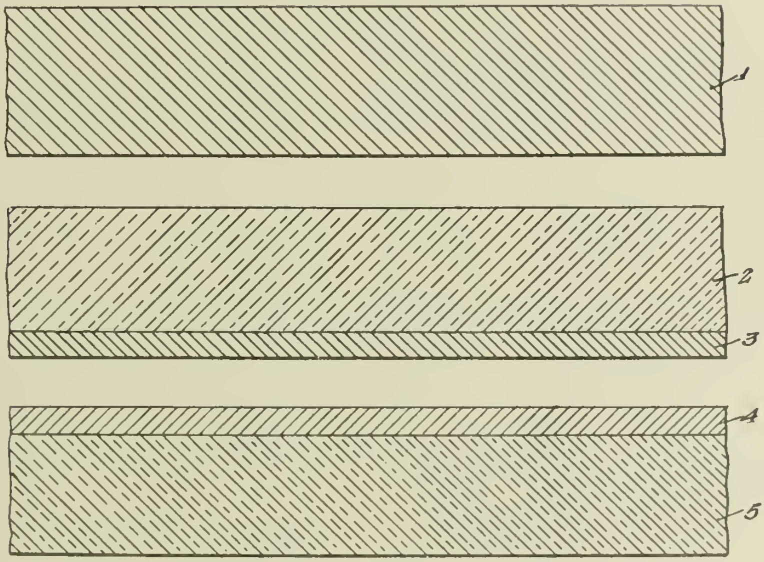

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ALIEN PROPERTY CUSTODIAN

METHODS OF RENDERING THE INDICATION OF ELECTROMETRIC MEASURING INSTRUMENTS PROVIDED WITH DIAPHRAGM ELECTRODES, PARTICULARLY WITH GLASS ELECTRODES, INDEPENDENT OF THE FLUCTUATIONS OF TEMPERATURE

Fritz Lieneweg, Berlin-Siemensstadt, Germany; vested in the Alien Property Custodian

Application filed April 19, 1941

This invention relates to a method of rendering the indication of electrometric measuring instruments provided with diaphragm electrodes, particularly with glass electrodes, independent of the fluctuations of temperature.

Until recently only non-current consuming devices such as, for instance, tube voltmeters or compensators had been employed in determining the potential of glass electrodes, since such devices were provided with glass electrodes having a great inner resistance of the order of magnitude of some megohms. Since it has been possible to reduce to a considerable extent the inner resistance by the use of special types of glass, also current-consuming measuring instruments can be employed and the potential may be directly determined without the use of compensators, for instance, by means of a galvanometer connected in series with a suitable resistance.

The use of the testing method with the aid of current consuming instruments presents, however, a difficulty inherent in the very high temperature coefficient of the inner resistance of the diaphragm electrode. While a variation in resistance has no influence whatever on the test reading when carrying out measurements with the aid of non-current consuming instruments, the indication of a measuring instrument is greatly influenced by the changes in the inner resistance as soon as on the one hand current is consumed and on the other hand the outer resistance is not sufficiently great as compared with the inner resistance of the energy source. However, since the inner resistance of the low ohmic glass electrode amounts to about 100,000 ohms and over it is not possible to make the outer resistance sufficiently great according to the above requirement. The temperature of the measuring liquid had to be therefore kept constant in a very accurate manner, insofar as, for instance, in the case of glass electrodes a 100% change in resistance corresponds to a change in temperature of 10 degrees centigrade. However, this is at all events very disadvantageous, particularly when effecting a continuous control.

The invention consists in rendering even without the use of thermostats, i. e., in the case of a fluctuating temperature of the measuring liquid the indication of measuring instruments provided with glass electrodes and current consuming measuring mechanisms independent of the fluctuations of temperature. This is accomplished according to the invention by eliminating the influence of temperature by means of known compensating circuits with temperature responsive resistances whose temperature responsive elements consist of glass electrodes hereinafter called resistance electrodes and which have the same temperature coefficient as the measuring electrode. The use of such a resistance electrode makes it possible to employ a compensating circuit used for other purposes for glass electrodes also, since the absolute value of the temperature responsive resistance must be relatively large and must furthermore have a very great temperature coefficient. The use of an electrode as a temperature compensator of the same nature as the measuring electrode has furthermore the advantage in that the compensation is very accurate over the entire measuring range in contradistinction to similar circuits, since the resistance in the measuring and compensation electrode is independent of the value to be measured. Moreover, also the influence of temperature may be compensated for at the same time, brought about by the fact that the voltage to be tested varies with varying temperature other conditions being equal.

In the accompanying drawings is shown an arrangement in diagrammatic form, by means of which the method according to the invention may be carried out.

Fig. 1 shows a suitable compensating circuit with the testing device **1** and the temperature responsive resistance (resistance cell) **2**. The galvanometer **3** inserted in the diagonal of the bridge serves to indicate the value to be measured. One of the bridge resistances **4**, **5** is of the variable type for the purpose to be hereinafter described. Figs. 2 and 3 show two possible forms of resistance cells. In a vessel **6** containing an electrolytically conducting liquid **7** are immersed two electrodes **8** and **9**, one of which, for instance, the electrode **9** is the resistance electrode, i. e., the glass electrode. The electrode **8** hereinafter called standard electrode may be of any type, for instance, an antimony- or silver-chloride electrode, it being preferable to choose the two standard electrodes in the measuring and resistance cell of the same type, for instance, in the form of calomel reference electrodes, since an accurate compensation of temperature both as to the inner resistance and as to the potential itself is then attained. In this case a potential difference occurs between the two electrodes **8** and **9**. This will not impair the test, for owing to the bridge connection it is easily possible to compensate constant first harmonic voltages which may occur, by suitably dimensioning the bridge branches and to adjust any pH-initial value. For this reason, one of the bridge

resistances, for instance, the resistance 4 should be of the variable type. However, it is also possible to employ for the standard electrode 8 a glass electrode so that in this case the potential difference between the two electrodes is zero, the potential tolerances of the single electrodes not being considered.

In the embodiment shown in Fig. 2 it is assumed that the resistance electrode is a glass electrode with a metallic lead for carrying away the potential. However, as is shown in Fig. 3 also a glass electrode with an electrolyte may be employed for carrying away the potential. In this case an auxiliary electrode 10 which is immersed in the filling liquid 11 of the resistance electrode may serve for carrying away the potential of the resistance electrode 9. In case the liquid 11 has the same pH-value as the auxiliary liquid 7 and an electrode of the same nature as the standard electrode 8 is employed for the electrode 10 the potential difference 0 occurs across the terminals of the resistance cells. However, if as filling liquid 11 such a liquid is used whose pH-value differs from that of the auxiliary liquid 7 both the temperature coefficient of the inner resistance of the electrode and the influence of temperature of the potential are eliminated in the case of fluctuations of temperature. Also in the arrangement according to Fig. 2 having two glass electrodes it is possible to carry out this double compensation by arranging a porous wall therebetween.

To attain as accurate a compensation as possible of the temperature which follows as rapidly as possible also the fluctuations of temperature, the resistance cell is brought on the one hand into proper heat contact with the measuring liquid and on the other hand it is so dimensioned that changes in temperature become rapidly effective. It is therefore preferable to keep the resistance cell small and to manufacture the vessel 6 of a highly heat conducting material. However, in this case care should be taken to see that the resistance cell be electrically insulated from the measuring liquid.

FRITZ LIENEWEG.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

F. LIENEWEG

METHODS OF RENDERING THE INDICATION OF ELECTROMETRIC MEASURING INSTRUMENTS PROVIDED WITH DIAPHRAGM ELECTRODES, PARTICULARLY WITH GLASS ELECTRODES, INDEPENDENT OF THE FLUCTUATIONS OF TEMPERATURE

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Serial No. 389,474

Fig. 1

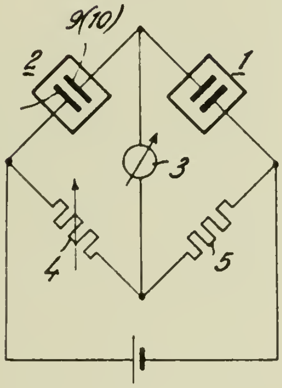


Fig. 2

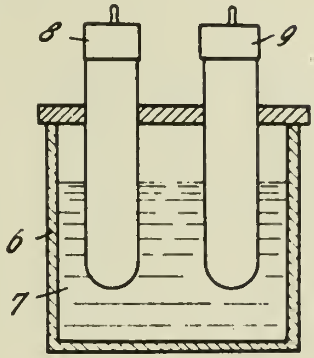
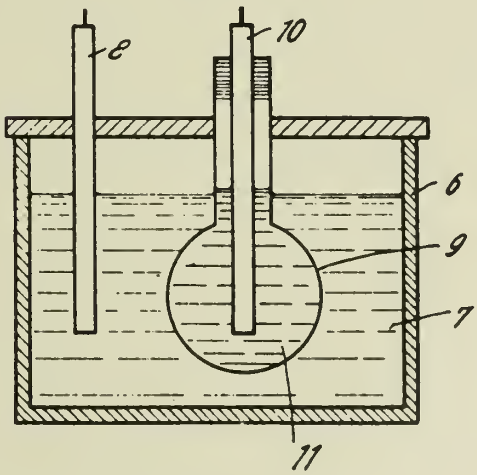


Fig. 3



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ALIEN PROPERTY CUSTODIAN

PROCESS FOR DRIVING OUT OCCLUSIONS OF GASES LIKE HYDROGEN FROM THE SURFACE LAYERS OF WORK-PIECES

Richard Beck, Wiesbaden, Germany; vested in the Alien Property Custodian

No Drawing. Application filed April 25, 1941

This invention relates to a process for driving out occlusions of gases like hydrogen from the surface layers of work-pieces in an electrolytic manner to increase the resistance to corrosion of such layers. The most important field of application of the process is the pretreatment of metals to be coated for subsequent electroplating so as to impart to the work a surface quality adapted for placing thereon metallic deposits of any kind and producing durable coatings of high corrosion resistance.

Owing to its great advantages compared with those obtainable by the application of the formerly usually employed mechanical or chemical cleaning treatments, the electrochemical treatment of metallic work-pieces for the purpose of removing foreign external impurities, the oxidic surface films and foreign matter embedded in the surface layers in the course of production, particularly for preparing the surface for the subsequent provision of a deposit, has been more and more adopted of late.

Electrolytic refining or cleaning processes in which the metal objects to be treated are used either as cathode or as anode in an electrolytic bath are in particular widely employed.

Of these processes the anodic treatment is especially effective and, above all, applicable where it is necessary to neutralize, as for subsequent electroplating, the hydrogen found in the surface layers of a work, which enters the metal, or is not oxidized, during the cathodic cleaning as well as for instance during pickling in an acid solution.

The known processes of the latter class are, however, open to the objection that their application involves partial dissolution of the metal treated and redeposition of the dissolved metal in oxidic form on the surface of the work, which implicates an undesirable loss of material and necessitates also subsequent treatment of the work in a mechanical or chemical manner to remove again these oxides. The known process failed, moreover, even if the current was allowed to act for a long time, to remove with sufficient penetrative effect the foreign constituents of the metal, especially carbides, etc. embedded between the crystallites of the metal structure, though this foreign matter is also a cause for the manifestation of corrosion in the metal coating.

The invention avoids the drawbacks of the hitherto known anodic treating methods and provides a process which insures complete liberation of the surface of a work not only from all oxide films but also from the carbides, etc. embedded in the body of the metal, as well as full oxidation of the hydrogen contained in the pores of the metal.

The invention is based on the knowledge that the process of the dissolution of the metal and of the reoxidation thereof does not occur immediately after current is applied to the bath containing the work serving as anode, but sets in, depending on the nature of the alkaline or neutral, though not acid, bath, a certain time after the current has begun to act. The gas reactions, on the other hand, i. e. the oxidation of the hydrogen and the conversion of the carbides, etc. whose presence directly at the surface of a work subsequently to be coated is highly detrimental and absolutely prevents for instance the production of deposits free from pores in electroplating commence as soon as the current begins to act.

In view of these facts the invention proposes to operate the bath in which the work, previously preferably cathodically treated to effect decreasing and removal of the surface oxide films, is used as anode by current impulses occuring at interval the duration of which and of the impulses is adapted to the peculiar nature of the metal and of the electrolyte in such manner that the reactions leading to the formation of an oxidic deposit of the metal on the work do not set in as yet.

The duration of each current action differs therefore and, depending on circumstances, may last up to 60 seconds, though it is much shorter as a rule and may amount to less than one second. The actions of the current are continued until it is apparent that all oxidizable constituents, besides the metal treated, are completely oxidized at the surface. This can be well observed with the naked eye. For example, during the first current impulses islands- and band-like regions appear on a test piece, which are irregularly distributed over the entire surface and on which a particularly strong gas development can be noticed. After a certain number of impulses these at first clearly contrasting regions disappear, and the gas development proceeds uniformly over the entire area. At this moment no oxidizable constituents are present any more.

The new process is preferably carried out with the aid of a switch connected in the circuit for automatically cutting off and interrupting the current for adjustable periods.

When the above-mentioned condition has been reached, the current is shut off, the work taken out and rinsed and may then for instance be directly electroplated.

Experiments have shown that electroplating produces a metal layer of highest quality, which is not only completely free from pores and pitting, but which is distinguished also by an extraordinary adhesiveness to the basic metal.

The layer produced is moreover, much more non-corrodible than a layer obtained in the usual manner.

At a comparison test 20 sheets were cathodically decreased in the customary way and then anodically treated uninterruptedly for 30 seconds. After this time the test sheet did not show any visible coat. The current was then cut off, and the sheets were rinsed and nickelplated for 30 minutes.

The sheets were subjected to the usual corrosion test by boiling in distilled water, that is, they were boiled for four minutes and then allowed to stand four hours in their boiling water. The subsequent count of rusty places yielded 1,486 points.

A second series of 20 sheets was treated in the same manner with the difference, however, that during the anodic treatment the current was applied only for one second whereupon the current supply was interrupted for another second. The sheets remained in the anodic bath for 30 seconds, but only 15 current impulses lasting one second each were applied, so that the total current action amounted to 15 seconds.

The corrosion test of these sheets, which were also immediately nickelplated for 30 minutes, disclosed only 176 rusty places, or only one-ninth of the number of such places found during the first test.

The application and effect of the new process have been described above with a view to employing it as a pretreating process for subsequent electroplating. The range of uses of the new process is, however, not limited hereto, but is far more general. The new process can be advantageously applied in all cases where occlusions of gas, particularly hydrogen, have to be driven out of the surface layers of work-pieces. It may serve for instance for after-treating already produced metal coatings to considerably increase their resistance to corrosion, or for giving intermediate treatment when electroplating several superposed metal layers of the same or different kind, as for instance for dehydrating a nickel layer prior to final chrome-plating.

At any rate, the invention is not restricted to the embodiments and possibilities of application described, but may be varied in many ways without deviating from its fundamental idea.

RICHARD BECK.

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ALIEN PROPERTY CUSTODIAN

CONVERSION OF COMBUSTIBLE CARBONACEOUS MATERIALS

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No Drawing. Application filed April 26, 1941

The present application is a continuation-in-part of our copending application Ser. No. 224,-488, filed August 12, 1938, which relates to the conversion of combustible carbonaceous materials and is particularly concerned with the production of liquid and/or solid hydrocarbons by the conversion of liquid and/or solid carbonaceous materials comprising aliphatic compounds at elevated temperatures and with the conversion of carbon monoxide with hydrogen into hydrocarbons containing more than one carbon atom in the molecule and/or solid or liquid oxygen-containing derivatives of hydrocarbons, such as methanol or higher alcohols, as for example propanol or isobutylalcohol, or aldehydes, ketones, acids and the like. The said application generally covers the conversion of combustible carbonaceous materials comprising essentially aliphatic compounds at elevated temperatures by heating such materials in the presence of substantial amounts of added cyclic hydrocarbons, and specifically claims the production of heavy fuels stable to knocking by cracking in the vapor phase at a temperature between 400° and 700° C hydrocarbon oils comprising essentially unsaturated aliphatic hydrocarbon oils boiling at least for their greater part above the boiling point range of benzine while adding a substantial amount of cyclic hydrocarbons which under the reaction conditions are vaporous, but in the absence of substantial amounts of added hydrogen or of gases supplying hydrogen.

The present application is more particularly concerned with the production of valuable products by subjecting to a non-splitting dehydrogenation liquid or solid hydrocarbons or liquid or solid oxygen-containing derivatives of hydrocarbons in the gaseous or vaporous phase, in the presence of hydrogen and with an addition of cyclic hydrocarbons which are for their greater part or wholly in the vaporous state under the conditions employed.

In conversions of the said carbonaceous materials at elevated temperatures, such as cracking, dehydrogenation or destructive hydrogenation or in the hydrogenation of these materials without pressure or in the interaction of carbon monoxide with hydrogen there is often the inconvenience that a considerable amount of undesirable low-molecular, in particular gaseous, hydrocarbons are formed especially when working in the gas or vapor phase and when using very active catalysts and thereby the yield of the desired products is reduced.

We have now found that this inconvenience may be overcome by carrying out the said conversions of carbonaceous materials essentially comprising aliphatic compounds in the presence of a substantial amount of added cyclic hydrocarbons. These cyclic hydrocarbons have proved to substantially suppress or diminish the said tendency of gas formation.

Thus the said operation in the presence of added cyclic hydrocarbons is very useful in the production of non-knocking motor fuels, in particular safety fuel, by heating hydrocarbon oils to cracking temperatures, especially when starting from hydrocarbon oils which consist wholly or substantially of unsaturated aliphatic hydrocarbons and boil, at least for their greater part, above the boiling point range of benzine. As additional cyclic hydrocarbons come into consideration in particular mono-nuclear, aromatic hydrocarbons, such as benzene, toluene and xylene.

Oil fractions rich in unsaturated hydrocarbons and boiling mainly above 200° C may be obtained, for example, by cracking mineral oils, tars or fractions thereof, for example mineral oil or brown coal tar fractions containing paraffin wax, or destructive hydrogenation products of coals, tars, mineral oils and the like. Cracking products of hydrocarbon oils which result from the reduction of carbon monoxide, are also suitable. The said initial materials are mixed, before or during the heating to cracking temperatures, with cyclic, particularly mono-nuclear, aromatic hydrocarbons, such as benzene, toluene, xylene and the like, or also with the hydrogenation products thereof or with hydrogenated naphthalenes. The mixture is passed in gaseous form through a chamber heated to from 400° to 700°, preferably to from 450 to 600° C.

The said cracking reaction is preferably carried out in the presence of catalysts, more specifically the metals of the 2nd to the 8th groups of the periodic system or their compounds. As examples of the latter may be mentioned the sulphides, oxides, phosphates, halides or sulphates of iron, cobalt or nickel, and also of chromium, vanadium, aluminum, zinc, tin, manganese, titanium, magnesium, tungsten, molybdenum and the like.

It is of special advantage to apply the metal compounds to carriers, for example substances having large surface areas, such as bleaching earths, active charcoal, brown coal small coke and the like, which may, if desired, be subjected to a pretreatment with acid substances, as for example hydrogen fluoride. In some cases it is

of advantage to carry out the reaction in the presence of halogen or of gaseous or vaporous halogen or sulphur compounds.

The said reaction may also be carried out under increased pressure as for example at 20 to 200 atmospheres or more.

In order to ensure a far-reaching polymerization or condensation of any low boiling unsaturated compounds formed, it may in some cases be of advantage to provide for another zone behind the cracking zone, in which the products are kept for some time at elevated temperature. The products may also, following the cracking zone, be passed over a catalyst which promotes the polymerization or the condensation. With a view to accelerating the polymerization, the splitting catalyst may also be mixed, preferably in the last part of the splitting chamber, with catalysts having a polymerizing action. Catalysts suitable for this purpose are for example certain metal halides, such as aluminum chloride, iron chloride and the like, or phosphoric acid, boric acid, if desired together with oxalic acid and the like.

Another example of conversions which may be carried out with advantage in the above described manner is the conversion of the low molecular weight paraffin hydrocarbons, such as ethane, propane, butane or low-boiling liquid paraffin hydrocarbons, into non-knocking motor fuels; also in this conversion the difficulty arises that considerable amounts of low molecular weight hydrocarbons, in particular the lowest member of the series, methane, are formed. On the other hand, when using methane itself very high temperatures are necessary. In every case there also takes place considerable deposition of carbon.

We have found that paraffin hydrocarbons can be employed in a very advantageous manner for the preparation of valuable non-knocking fuels by subjecting them together with cyclic hydrocarbons to a thermal treatment at temperatures above 300° C., preferably in the presence of rigidly arranged catalysts. Cyclic hydrocarbons suitable for this purpose are especially low boiling aromatic and hydroaromatic hydrocarbons which may also be employed in admixture with each other. The treatment is preferably carried out in the vapor phase.

As paraffin hydrocarbons there may be mentioned for example benzines or middle oils from paraffin-basic petroleums or from destructive hydrogenation products of coals, such as brown coals, or of tars, in particular brown coal tars, or of mineral oils, or liquid fractions of the products obtained by the reduction of carbon monoxide, and also corresponding fractions of hydrocarbons rich in hydrogen which have been obtained by the treatment of oils with selective solvents. Of the gaseous paraffinic hydrocarbons, pentane, butane and propane are especially suitable for the treatment. They may be taken from any source, as for example from cracking gases or from the gaseous portions of the products obtained by the reduction of carbon monoxide with hydrogen and the like. As low boiling aromatic hydrocarbons there may be employed preferably benzene or its homologues; hydrogenation products of these substances or naphthalene or its hydrogenation products are also suitable. In the mixtures to be treated, the proportion of the aromatic and/or hydroaromatic hydrocarbons advantageously amounts to between about 10 and 50 per cent; in many cases it may be even greater. The aromatic and/or hydroaromatic hydrocarbons should boil substantially in the boiling range of the benzines, i. e. below about 220° C.

The paraffinic hydrocarbons may be mixed with the aromatic and/or hydroaromatic hydrocarbons in the liquid or vapor phase. The mixture is then subjected in the vapor phase to the thermal treatment at temperatures of between 300° and 700°, advantageously between 450° and 650° C. and preferably in the presence of catalysts.

The liquid mixture or the two components may also be heated before the catalytic treatment to temperatures which are higher than those necessary for their evaporation. Thus for example the initial materials may be heated to about 500° C. and then led at the said temperature over the catalysts.

Of the low boiling paraffinic hydrocarbons, liquid and gaseous hydrocarbons may be present at the same time. In this case it is advantageous to heat the mixture of the liquid paraffins with the aromatics for example to about 480° C. and to heat the gaseous hydrocarbons separately therefrom, for example to from 500° to 700° C., the hot vapors then being united with the heated gases and the whole treated at from 450° to 700° C., preferably in the presence of catalysts.

The nature of the catalysts to be used depends on the conditions used, in particular on the temperature, and also on the nature of the paraffinic hydrocarbons. The paraffinic hydrocarbons are advantageously treated in the presence of catalysts having a splitting or dehydrogenating action. Catalysts may also be used, however, which have, in addition to a splitting action, also a polymerizing action, or there may be added to splitting catalysts larger or smaller proportions of catalysts having a polymerizing action. The latter may also be brought into reaction separately from the catalysts having a splitting or dehydrogenating action in a second, closed reaction vessel.

At least one of the said actions is exerted by most metals of the 2nd to the 8th groups of the periodic system or their compounds. For example the sulphides, oxides, phosphates, halides or sulphates of iron, cobalt, nickel, chromium, vanadium, aluminum, zinc, tin, manganese, titanium, magnesium, tungsten and molybdenum are suitable as catalysts for the said treatment.

The said metals or metal compounds are advantageously applied to carriers, as for example to bodies having large surfaces, such as fuller's earth, bleaching earths, silicates and silica gel, or active carbons, lignite small coke which may if desired be pretreated with acid substances, in particular hydrogen fluoride.

In many cases it is preferable to carry out the reaction in the presence of halogens or volatile compounds of halogens or other non-metals, as for example volatile sulphur or phosphorus compounds, or of hydrogen, preferably with a low partial pressure of the hydrogen (up to about 30 per cent of the total pressure).

The reaction may be carried out at atmospheric or increased pressure, as for example at from 20 to 200 atmospheres or more.

The gases formed may be led back again to the reaction. The liquid products obtained may be subjected to a refining, as for example a refining destructive hydrogenation.

Very good results are obtained when carrying out the reactions in consideration, while maintaining the gas or vapor phase, in the presence of added cyclic hydrocarbons which under the reaction conditions are at least partly vaporous.

Both aromatic hydrocarbons and naphthenes may be used. The most suitable substances are low boiling cyclic hydrocarbons of the boiling range of benzines (benzene, toluene, xylene and cyclohexane) and middle oils or products containing the same, such as mineral coal tar middle oil or middle oil from the liquefaction of mineral coal; substances of higher boiling point may also be added when under the reaction conditions they have such a vapor pressure that they are present to a considerable extent in the vapor form; this is the case for example with naphthalene and its homologues and also with lower boiling mineral coal tar fractions.

The said cyclic hydrocarbons are generally speaking added in amounts of between 10 and 60 per cent by weight with reference to the throughput of carbonaceous substances. The amount to be added in individual cases depends in particular on the nature of the reaction, on the activity of the catalyst and on the nature of the additional substance. The amounts added are greater in the case of catalysts which tend strongly to form gas than in the case of catalysts having this tendency to a lesser degree.

The cyclic hydrocarbons may be added continuously or at intervals. In the latter case the addition is preferably made when the formation of undesirable low molecular hydrocarbons begins to exceed the desirable degree, which may become evident by the occurrence of great evolution of heat. The additions may also be made at equal intervals of time. When adding the additional substances continuously, the amount added may be constant or variable. The cyclic hydrocarbons may also be added at several places in the reaction chamber. The catalyst may also be laden with cyclic hydrocarbons before use.

We have also found that in the reactions in consideration carried out in the gas or vapor phase the formation of undesirable hydrocarbons of low molecular weight can likewise be considerably reduced by adding at intervals of time cyclic hydrocarbons which at least in part remain liquid under the reaction conditions. Aromatic hydrocarbons and also naphthenes may be mentioned. Cyclic hydrocarbons which boil above 200° C are most suitable, such as anthracene oil or other mineral coal tar fractions boiling above 200° C. It is, however, also possible to add cyclic hydrocarbons of lower boiling point, as for example xylene, provided the pressure used during the reaction is so high or the temperature used is so low that the added substance remains liquid at least in part.

The amount to be added depends generally speaking on the length of the intervals of time, and also on the nature of the reaction, on the activity of the catalysts and on the nature of the added substances. The amounts added are larger in the case of catalysts having a strong tendency to form gas than in the case of catalysts with which this tendency is less.

The intervals of time between the single additions may be equal. The procedure may, however, also be that cyclic hydrocarbons are added only when the formation of undesirable hydrocarbons of low molecular weight commences to rise beyond the permissible degree, which may become evident by a rise in temperature. The cyclic hydrocarbons may also be added at several points in the reaction chamber. The catalyst may also be laden with cyclic hydrocarbons before use.

The said process is of great advantage in destructive hydrogenations in the presence of catalysts having a strong splitting action. Among such catalysts there may be mentioned for example oxides and sulphides of the metals of the 5th to the 7th groups of the periodic system and the iron group, as well as mixtures containing the same, and, for cracking, activated hydrosilicates, such as bleaching earths, or also alumina, magnesia, active carbon, lignite small coke or oxides of chromium, molybdenum, tungsten, manganese, iron, nickel, cobalt or titanium or mixtures of these substances.

In dehydrogenations, the process has the advantage that the partial splitting into low molecular hydrocarbons which is unavoidable in most cases is considerably reduced. The dehydrogenation is advantageously carried out in the presence of hydrogen which is preferably added in such amounts that formation of strongly unsaturated hydrocarbons, as for example diolefines or acetylene, is prevented and that the working life of the catalysts is prolonged, but not in such amounts that the formation of olefinic compounds is substantially reduced. In this particular conversion mainly the cyclic hydrocarbons which boil within the boiling range of benzines and gas oils come into consideration because these may wholly or for their greater part be kept in the vapor phase during the treatment. The said cyclic hydrocarbons may be added also in this particular conversion after intervals. When adding them continuously the amount supplied may be constant or variable. The cyclic hydrocarbons may also be added at several places into the reaction space.

In the reaction of carbon monoxide with hydrogen to form liquid or solid hydrocarbons or liquid or solid oxygen-containing derivatives of hydrocarbons, the addition of cyclic hydrocarbons hinders to a considerable extent the formation of gaseous hydrocarbons, in particular methane. When working in this reaction for the formation of high boiling hydrocarbons mixtures and/or praffin wax, the proportion of high molecular products formed may be considerably increased at the expense of the low molecular hydrocarbons, such as benzine, by the addition of cyclic hydrocarbons.

The said process is of special advantage in the reaction of carbon monoxide with hydrogen when using highly active catalysts having a strong tendency to form gaseous hydrocarbons, in particular methane. Such catalysts are in particular substances containing nickel, as for example those in which the nickel is present in admixture with other catalytically active substances, such as iron, cobalt or the compounds of rare earths, thorium, titanium, copper, zirconium, molybdenum, chromium, tungsten, germanium, manganese or of the alkali or alkaline earth metals, or also with the said metals themselves, and which may also be applied to carriers, such as active silicic acid, alumina, magnesia or zinc oxide. These catalysts containing nickel are prepared in known manner, as for example by reduction from the oxides, the oxalate or carbonate in the presence of reducing gases, such as hydrogen and/or carbon monoxide and at temperatures between 200° and 500° C, or even at higher temperatures, as for example 700°, 800° or 1000° C, whereby the substances may be heated until a partial sintering takes place (for example from about 2 to 4 hours at 850° C).

Even in the case of catalysts containing no nickel, however, the addition of the said cyclic compounds is of advantage. Among such there may be mentioned in particular substances containing iron, as for example iron obtained by the

reduction of fused ferrosoferric oxide, which is advantageously provided with additions of other substances, such as titanium or silicon or their compounds, or iron obtained by reduction of non-fused iron compounds and simultaneous or subsequent sintering, which likewise may contain additions of other substances.

The same is true for catalysts containing cobalt.

In the reaction of carbon monoxide with hydrogen to form liquid or solid oxygen-containing derivatives of hydrocarbons, the catalysts known for this reaction are used, in particular the oxides of the alkali, alkaline earth and earth metals or of zinc, chromium, boron, titanium, vanadium, niobium, tantalum or manganese.

The said reactions are carried out under known conditions, the destructive hydrogenations at temperatures between 250° and 600° C and under increased pressure, advantageously of more than 20 atmospheres the cracking at temperatures between 300° and 700°, advantageously between 300° and 550° C and at atmospheric or preferably at increased pressure (as for example 20 to 200 atmospheres or more), the dehydrogenation at temperatures between 400° and 600° C and the reaction of carbon monoxide with hydrogen at temperatures between 150° and 450°, preferably between 180° and 300° C, at atmospheric or increased pressure, as for example between 5 and 200 atmospheres.

The other conditions, such as time of treatment, relative proportions of the reactants and the like are also as usual. The cracking may be carried out in the presence of gases, such as hydrogen, carbon monoxide, carbon dioxide, methane, ethane, propane or ethylene, propylene or butylene, which have preferably been previously heated to the temperatures used in the splitting or to still higher temperatures. The reaction of carbon monoxide and hydrogen may be carried out in the presence of accompanying gases, such as carbon dioxide or methane. The proportion of the carbon monoxide content to the hydrogen content in the initial gas may be different.

In the reactions in which no building up into products of higher molecular weight, as in the reduction of carbon monoxide, takes place, i. e. in destructive hydrogenation, cracking and dehydrogenation, vaporizable substances are used as initial materials, as for example petroleums, tar oils, liquid carbon monoxide reduction products and oils obtained by destructive hydrogenation of coals or by polymerization of olefines.

The following examples will further illustrate the nature of this invention but the invention is not restricted to these examples.

Example 1

A fraction, boiling between 150° and 300° C, of a cracking product of brown coal paraffin wax and an equal proportion of benzene are heated to 510° C in a tubular reaction chamber, under a pressure of 150 atmospheres. The reaction product obtained is then subjected to a fractional distillation. The fraction boiling between 140° and 200° C is, after it has been refined with sulphuric acid or bleaching earth, an efficient anti-knock safety fuel having a high flash-point.

Example 2

Butane is heated to 530° C under a pressure of 250 atmospheres and at a speed of throughput of 2 kilograms per liter of heated spiral volume and per hour in an externally heated tubular spiral. With each kilogram of the butane thus heated there are mixed 0.25 kilogram of benzene and 40 liters of hydrogen. The mixture is then led at 530° C over a sulphurized mixture of molybdic acid, zinc oxide and magnesia as a catalyst. There is thus formed a product the fraction of which boiling up to 180° C may be used very advantageously as an addition for improving the non-knocking properties of motor fuels. By subjecting the product to hydrogenating refining, a valuable motor fuel having very good non-knocking properties is obtained.

Example 3

A hydrocarbon mixture boiling between 200° and 350° C, obtained by reduction of carbon monoxide, is led together with 10 per cent by volume of crude benzene at 460° C over a catalyst consisting of aluminum hydrosilicate. The addition of crude benzene effects a reduction in the gasification to hydrocarbons having 3 and 4 carbon atoms by 35 per cent.

Example 4

A gas consisting of carbon monoxide and hydrogen in the ratio of 1:2 is led at 330° C together with 5 kilograms of sulphur-free benzene vapor per 100 cubic meters of gas under a pressure of 50 atmospheres over a multi-substance catalyst containing mainly nickel. 110 grams of liquid hydrocarbons are obtained per cubic meter of gas; without the addition of benzene the greater part of the reaction products consists of gaseous hydrocarbons.

Example 5

A hydrocarbon mixture boiling between 200° and 350° C obtained by reduction of carbon monoxide is led at 460° C and under a pressure of 30 atmospheres over a catalyst of aluminum hydrosilicate. There are thus formed from 100 kilograms of initial product, 18 kilograms of benzine and 15 kilograms of gaseous hydrocarbons. If, in addition to the abovementioned hydrocarbon mixture, there be added for 5 minutes at 30 minute intervals a mineral coal tar oil fraction boiling between 225° and 380° C in an amount of 10 per cent by weight of the hourly throughput of the hydrocarbon mixture to be treated, only 1 kilogram of gaseous hydrocarbons is formed.

Example 6

A gas consisting of carbon monoxide and hydrogen in the ratio of 1:2 is led under a pressure of 50 atmospheres at 230° C over a multi-substance catalyst containing mainly nickel.

At intervals of from 15 to 30 minutes, from 3 to 10 grams of tetrahydronaphthalene are supplied to the reaction chamber per cubic meter of gas. The waste due to the formation of gaseous hydrocarbons is considerably reduced.

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ALIEN PROPERTY CUSTODIAN

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES

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Application filed April 28, 1941

The present invention relates to a starter for explosion engines, particularly applicable to removable out-board engines for boats.

It is known that engines of this type are generally started by means of a cable which is provided with a handle and is wound on a pulley which is retracted by a spring and which is secured to the driving shaft, when the pull is exerted on the cable, by means of a free-wheel, of a pawl coupling, or of a similar device, enabling the pulley to be released from the engine as soon as the latter has started. However, in most of the devices of this type, any backward rotation of the engine, due for example to an overheated spark plug or to a stoppage on the compression stroke, causes the starting pulley to be driven backwards by the engine and consequently the breaking of the cable or, if the latter resists, the breaking of the other members of the device.

In other devices which have also already been proposed, the members of the starter which are adapted to engage with the engine are first of all subjected to an axial movement by means of a screw and nut system, the pulley which is actuated by the cable resting on the flywheel of the engine by means of thrust ball bearings and being secured to a screw-threaded bush on which is engaged a braked nut which carries the actuating members adapted to engage with said flywheel. This device enables the accidents due to the reverse rotation of the engine to be avoided, but has the drawback that any lack of lubrication or any introduction of a foreign body into the thrust ball bearings produces an untimely coupling which causes serious damage.

The starter which is the object of the present invention is intended to remedy all these drawbacks and it is characterized by the feature that the coupling between the starting pulley and the engine is effected in such a manner that none of the members of the starter is in contact with the driving shaft when the cable is released.

By way of example, two embodiments of the starter which is the object of the invention have been described hereinafter and illustrated in the accompanying drawing in which:

Fig. 1 is a perspective view, with parts broken away, of a first embodiment of the invention.

Fig. 2 is a partial view of a modification of the device of Fig. 1.

Fig. 3 is a perspective view of a second embodiment of the invention.

Referring to the drawing (Fig. 1), in a case **1**, which is fixed on the crankcase of the engine above the flywheel **2** of the latter, there is mounted, in such a manner that it can rotate freely, a shaft **3** which is arranged in the extension of the shaft of the engine, but is not in contact with said engine shaft, said shaft **3** being suspended in a bearing **4** secured to the top of the case **1**. The lower end of the shaft **3** carries a plate **5** on which are pivoted, on spindles **6**, **6'** . . . eccentric cams **7**, **7'** . . . which are adapted to wedge, by pivoting in the direction of the arrows *f*, against a cylindrical flange **8** provided on the flywheel **2** of the engine. According to the invention, this pivoting of the cams is positively controlled by the starting operation and as soon as said operation is finished, the cams **7** are automatically returned to their initial position so as to eliminate any contact between the starter and the engine. For this purpose, the pulley **9**, on which the cable **10** actuated by the handle **11** is wound and fixed by its end, is loosely mounted on the shaft **3** by means of a sleeve **12**, the lower end of which carries a plate **13** on which are fixed fingers **14**, **14'** . . . which are equal in number to the cams **7**, **7'** . . . and pass through the plate **5** of the shaft **3** in arcuate grooves **15**, **15'** . . . and engage in radial grooves **16**, **16'** . . . provided in the cams **7**, **7'** . . . A retracting spring **17**, which opposes the pull of the cable **10**, connects the pulley **9** to the case **1**.

The device operates as follows:

A pull exerted on the cable **10** by means of the handle **11** causes the pulley **9** and the plate **13** to rotate in the direction of the arrow F; during the first phase of this movement, the fingers **14** of the plate **13** move, without driving the plate **5**, in the grooves **15** and cause the cams **7** to pivot and wedge themselves against the circular flange **8** of the flywheel **2**, so that, from this time onwards, the engine is rotated. When the engine has been started and the cable **10** released, the retracting spring **17** returns the pulley backwards, this return movement causing the coupling cams **7** to be pivoted in the opposite direction by the fingers **14**. In this manner, the starter is completely separated from the engine and there is no danger of any accident when a backward rotation of the engine occurs and no untimely coupling can take place.

In the modification shown in Fig. 2, the cams are shaped like pawls **18**, **18'** . . . the noses of which are adapted to engage with teeth **19** provided on the circular flange **8** of the flywheel **2**, the operation being identical with that described above with reference to the device shown in Fig. 1.

In the embodiment shown in Fig. 3, the pul-

ley 9, which is actuated by the cable 10 and the handle 11, is fixed on a shaft 20, the upper end of which is provided with a screw-thread 21 engaged in a tapped bush 22 secured to the top of the case 1, said screw-thread being such that the shaft 20 moves downwards as it rotates when the cable 10 is pulled, and moves upwards again by the action of the retracting spring 17 when the cable is released. The lower end of the shaft 20 carries a free-wheel formed by a plate 23 provided with ramps, rollers 24, 24′ . . . and an external ring 25 carrying teeth 26, 26′ which are adapted to mesh, when the shaft 20 is in its low position, with the teeth 27 of a cylindrical flange 28 fixed on the flywheel 2 of the engine.

When a pull is exerted on the cable 10 by means of the handle 11, the pulley is rotated and rotates the shaft 20 and the free-wheel 23—24—25, the whole arrangement effecting a downward movement owing to the screw-thread 21—22, so that the teeth 26 mesh with the teeth 27 and drive the engine. When the engine has been started, the cable is released and the retracting spring 17 causes the whole arrangement to move upwards into its initial position, thereby completely separating the starter from the engine. In the event of a backward rotation of the engine during the starting operation, the teeth 27 rotate the free-wheel in the reverse direction to the starting direction, thereby causing the shaft 20 to screw into the bush 22 and therefore the teeth 26 to become quickly disengaged, so that any danger of an accident is eliminated.

While there has been described what is at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention.

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J. R. GOIOT
STARTING DEVICE FOR INTERNAL
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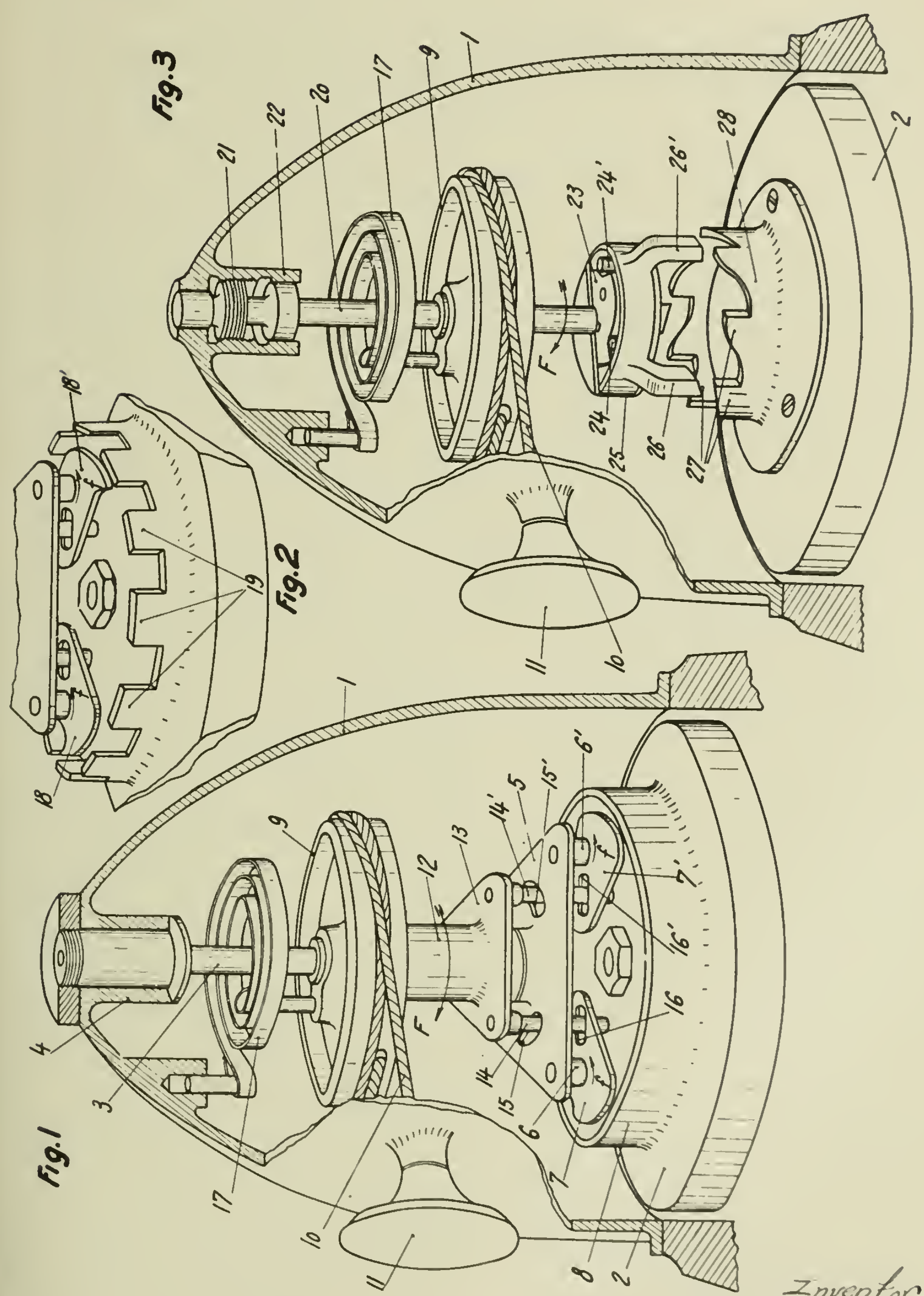

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ALIEN PROPERTY CUSTODIAN

MAGNETIC SYSTEM

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Application filed May 3, 1941

This invention relates to such magnet systems comprising one or more air gaps which either have an electric energisation or are provided with one or more permanent magnets and which are built up from material of good magnetic conductivity at inductions higher than 10,000 Gauss.

In such magnet systems the total weight of the system with a field intensity of from 6000 to 8000 Gauss in the air-gap with the utilisation of a permanent magnet having a $(BH)_{max}$ lower than 2,000,000 will be substantially governed by the quality of the magnet steel used. In this case it is amply sufficient that the material of magnetic conductivity employed for the other parts of the circuit should be normally fired soft iron. The use of material having special magnetic properties does not give any particular advantage. If, however, in the construction of the system use is made of a magnet steel whose $(BH)_{max}$ is higher than 2,500,000, say 5,000,000, it is possible to ensure a considerable increase of the field intensity in the air gap or else a considerable saving in weight of the magnet system with identical field intensity in the air gap if the soft iron is replaced by material of higher conductivity at a high induction.

In the use of electrical energisation of magnetic circuits also a considerable reduction of the quantity of magnetic material or else a reduction in energisation can be obtained if at high inductions use is made of material having a particularly high permeability.

It is well-known that for the purpose of obtaining the maximum field intensity in the air gap or of reducing the dimensions of the circuit use may be made at given points of material exhibiting very high magnetic conductivity at inductions higher than 10,000 Gauss. As an example of such material, it has been proposed to use an iron-cobalt alloy containing substantially equal parts of iron and cobalt. Because of the magnetic isotropy of the composing crystals this alloy has a high permeability in all directions independent of the crystal orientation.

According to the invention, the magnetic material used is an alloy containing a substantial proportion of iron, and thus having a positive crystal anisotropy, but having added to it one or more elements in such amounts that while cooling from the solidification temperature down to ordinary temperature the alloy only traverses the magnetic transition point (Curie point), the cooling of the fusion being directed in such manner that the solidification gives rise to directional crystals (columnar crystals) whose direction is selected with reference to that direction of the magnetic field which is to be expected in the magnet system.

It has been found that the orientation of these columnar crystals is such that a [1,0,0] direction extends parallel with the direction of the columns. Since with materials exhibiting positive crystal anisotropy the [1,0,0] direction has a very high magnetic conductivity at inductions which closely approach magnetic saturation, the direction of the columnar crystals with such material is always a direction of good magnetic conductivity. For other directions the magnetic conductivity is generally much lower due to the arbitrary orientation of the columnar crystals about their long axis.

The use of this material leads to a decrease of the magnetic leakage in the proximity of the air gap and thus to an increase of the field intensity in the air gap.

Besides, the iron alloy according to the invention is more easily machined than the well-known iron-cobalt alloys.

For parts of the magnetic circuit in which the lines of force are curvilinear, such as in pole pieces, the said alloy comprising directional columnar crystals cannot be used directly, since colunmar crystals can only grow out along a straight line. By jumping-up, the material may, however, be shaped into such form that the desired correlation of the crystal orientation to the direction of the lines of force is obtained. After the jumping-up operation the material must, however, be refired in order that the internal stresses produced may be removed.

Another solution consists in that at the given point use is made of the magnetically isotropic iron-cobalt alloy known per se and improved by the invention. An alloy containing 50% of iron and 50% of cobalt has a high permeability in all directions. According to the invention this alloy has added to it manganese, aluminium or silicon or a combination thereof to the extent of at least 0.1% and of not more than 5%. After casting and solidification the casting is reheated to such a temperature (from about 1200 to 1300° C) that the impurities insoluble in a solid state, such as oxides and sulphides, clog together. The material is then heated for a comparatively long time in accordance with the thickness of the casting at a temperature closely below the transition point of the alpha-gamma phase of the alloy in a reducing atmosphere so that decarbonisation occurs.

In order that the invention may be clearly understood and readily carried into effect it will now be described more fully with reference to the accompanying drawings, in which

Figs. 1 and 2 are diagrams of the variation of the solidification temperature and the transition points of iron-aluminium and iron-silicon alloys respectively.

Fig. 3 shows a casting and cooling method with a view of obtaining directional columnar crystals.

Fig. 4 shows the magnetisation curve of an iron-aluminium alloy having directional columnar crystals compared with soft iron.

Figs. 5, 6 and 7 show three forms of construction of elements thus cast of a magnet system.

Fig. 8 is a diagram of the solidification temperature and the transition points of iron-cobalt alloys.

Fig. 9 shows a magnet system of an electro-dynamic loudspeaker built up from different forms of magnetically conductive material.

Referring to Figs. 1 and 2, the line **10** indicates the variation of the solidification temperature of an iron-aluminium and an iron-silicon alloy respectively. The line **11** indicates, in either case, the variation of the transition points between gamma and alpha phases with temperature. On cooling from the solidification temperature to ordinary temperature an alloy of iron-aluminium containing more than 1½% of Al traverses no longer the gamma-phase but permanently remains in the alpha-phase. Thus, a crystal formation is set up which, with the correct manner of cooling, leads to columnar crystals. The line **12** indicates the variation of the magnetic transition point. This point is therefore always traversed during cooling so that the casting eventually cooled exhibits magnetically conductive properties, as is the case with an iron-silicon alloy comprising more than 2½% of silicon or an addition of silicon and aluminium in conjunction to the extent of more than 2%.

On the other hand, however, the addition of aluminium and silicon decreases the maximum induction obtainable of the alloy so that it is advisable that only this minimum quantity of aluminium or silicon should be used.

Fig. 3 illustrates the method of casting and directional cooling with a view of obtaining columnar crystals in the desired direction. A casting mould **13** having no bottom is placed on an artificially cooled copper plate **14**. The casting mould is surrounded by a furnace **15**.

The casting mould **13**, which in the present case is intended for the formation of a central pole of the magnet system of an electro-dynamic loudspeaker, has poured into it a quantity of a liquid iron-aluminium or iron-silicon alloy of the required composition. The furnace **15** is caused to assume a temperature of about 1200° C. so that the casting mould is itself also heated. The supply of heat to the furnace **15** is decreased so that the casting slowly cools entirely. The lowermost part of the casting **16** is in direct contact with the cooled plate **14**; hence all heat will be withdrawn from the casting in the direction of the arrow **17**.

There will be a formation of columnar crystals one of the axes of which extends parallel with the longitudinal axis of the cylindrical piece **16**. It has now been found that the [1,0,0] direction extends parallel with the long axis of the columnar crystals so that the maximum magnetic conductivity coincides with the direction of heat withdrawal, in the present case the longitudinal axis of the cylinder **16**. It is to be expected that the direction of the magnetic field in a central pole of an electro-dynamic magnetic system also extends along this axis.

Fig. 4 gives a graphical comparison between the magnetic conductivity of an iron-aluminium or iron-silicon alloy in the [1,0,0] direction of the columnar crystals and that of fired soft iron. According to the curve **18**, with a field-intensity of 5 Gauss the induction in soft iron is 13,000 Gauss, with a field intensity of 10 Gauss the induction is 15,000 Gauss. The curve **19** shows that with the said crystal form the induction is 19,000 Gauss with a field intensity of 5 Gauss and 20,000 Gauss with a field-intensity of 10 Gauss.

Fig. 5 shows a form of construction of a cylindrical component member **20** of a magnet system. As described with reference to Fig. 3, this piece has cooled to such extent during solidification that the [1,0,0] direction of the columnar crystals extends parallel with the longitudinal axis of the piece. The piece should be placed in such manner in a magnetic circuit that the field also extends in the direction of the longitudinal direction. These conditions occur, for example, with the central pole of an electro-dynamic magnet system.

The form of construction shown in Fig. 6 comprises a disc-like plate **21** in which a central cylindrical aperture **22** is formed. Component members of this kind are used, for example, as the annular pole plate of an electro-dynamic magnet system. The magnetic field to be expected extends radially in such a pole so that the withdrawal of heat, during solidification of such a piece should occur at the outer circumference and in this case the [1,0,0] direction of the columnar crystals is also radial.

Since columnar crystals can only grow out along a straight line component members of magnet systems in which the direction of the magnetic field diverges from the straight line cannot be built up directly from material crystallised in columnar crystals, since the magnetic conductivity is substantially less outside the [1,0,0] direction of the crystal. As a matter of fact it is, however, possible for such component members to be adapted for the object sought if the material is given such a form by jumping-up that the direction of the columnar crystals is altered to accord with the direction to be expected of the magnetic field. It is necessary that after jumping-up the internal stresses set up by firing should be removed although this results in the particularly favourable crystal form being slightly lost.

Fig. 7 shows a form of construction of the central pole pin of an electro-dynamic magnet system. The uppermost part **24** which forms the pole piece proper is so deformed by jumping-up of the cylindrical pin **23** that the direction of the columnar crystals is bent-off radially to the sides so that it is altered to accord with the direction of the lines of force that laterally emerge towards air gap.

Fig. 8 is a graph of the variations of the melting point and the transition points of iron cobalt alloys. The curve **25** shows the variation of the melting temperature for the various proportions of cobalt. The line **26** indicates the variation of the transition point between the gamma and delta phases of the iron in the case of lower proportions of cobalt. This region is, however, not important in connection with the object aimed at by the invention. The line **27** indicates

the variation of the transition between the gamma and alpha phases of the alloy, whereas the line 28 that partly coincides therewith characterizes the magnetic transition point.

For the alloys of about equal proportions of iron and cobalt, which are important in the present case, the transition temperature is comprised between the alpha and gamma phases at about 980° C., the magnetic transition point being located at the same temperature. If such alloys are cooled from the solidification point down to ordinary temperature, both the magnetic and the alpha-gamma phase transition points are passed through. The solidified alloy consequently has a magnetic conductivity. Besides the crystals of this alloy are isotropic, that is to say magnetizable along all axes so that in the construction of component members of magnet systems the direction to be expected of the lines of force need not be taken into account.

A limitation of an alloy containing iron and cobalt only is, however, that the cobalt must be added in a very pure state obtained by electrolytic agency. Impurities as is the case of technical cobalt won from the ore greatly reduce the magnetic conductivity. This disadvantage may, however, be obviated by the addition, in the use of technical cobalt, of manganese, aluminium or silicon or a combination of two or three of these metals in proportions of from 0.1% to not more than 5%.

After casting and solidification the casting is reheated in order that the impurities in the form of oxides and sulphides or the like which after solidification are enclosed, in a finely divided state, between the crystals and thus reduce the magnetic conductivity, are caused to clog together. This is effected at a temperature comprised between 1200° and 1300° C. Subsequently, the body has to be decarbonized in order that the magnetic conductivity may be further increased. This necessitates prolonged heating in a reducing atmosphere at a temperature closely below the point of transition to the gamma phase (which for 50% of Co and 50% of Fe is 980° C.), for example at about 950° C. So far as the time of decarbonization is concerned a firing of 1 hour is deemed the minimum value for component members of 1 mm. thickness. As regards thicker pieces to be worked, the time increases with the second power of the thickness so that for example a cylindrical pin of 25 mms. thickness has to be fired for at least 625 hours, i. e. about 4 weeks.

Fig. 9 shows a complete magnet system for an electro-dynamic loudspeaker built up from an annular permanent magnet 25, two cylindrical plates 26 and 27 and a cylindrical pin 28 comprising a pole piece 29 of magnetically conductive material. The permanent magnet 25 is made of magnet steel being an alloy of 13.5% nickel, 8% aluminium, 24% cobalt, 3% copper and 51.5% iron treated by the method described in Specification No. ——— U. S. Patent application Ser. No. 281,988. This permits of obtaining a $(BH)_{max}$ up to 4,700,000 so that this magnet steel is well adapted for constituting a magnet system of small size and of high field intensity in the air gap. In order that with small dimensions of the magnetic material it may nevertheless be possible to send a high magnetic flux through the air gap 30 outside the magnet itself it must be possible for high inductions to be admitted to the component members 26, 27, 28 and 29. Both plates are therefore cast from the iron alloy described before with positive crystal anisotropy crystallised in columnar crystals, which in this case are radially directed, because the variation of the lines of force in these plates is also radial. The cylindrical pin 28 is of the same composition and for similar reasons has a crystal direction parallel with the longitudinal axis. The uppermost part 29 of this pin, which constitutes the pole piece proper, is formed from the above-described cobalt-iron alloy, since the lines of force in the pin 28 extend axially but have to bend off radially in the proximity of the air gap 30 in order to pass out normally to the pole piece surface. The lines of force consequently extend in the pole piece 29 along a curvilinear path so that at this point material having columnar crystals directed so as to lie parallel to each other cannot be used but an alloy of isotropic crystal direction is preferable.

The form of construction described above is a magnet system for an electro-dynamic loudspeaker. The invention is, however, also applicable to other magnetic circuits, such as motors, relays, electro-magnetic systems and the like, briefly to any circuits in which magnetic fields are generated by one or more permanent magnets or by electric energisation.

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MAY 18, 1943.
BY A. P. C.

J. L. SNOEK ET AL
MAGNETIC SYSTEM
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Serial No.
391,620
2 Sheets-Sheet 1

Fig. 1

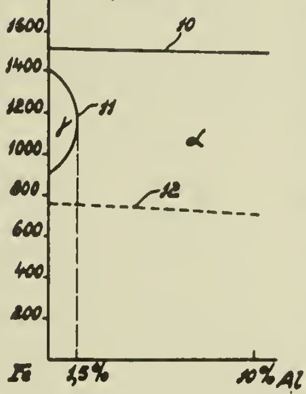


Fig. 2

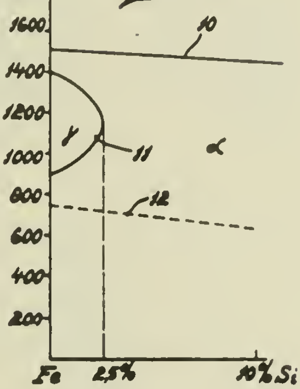
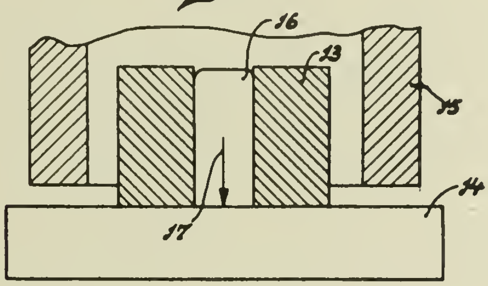


Fig. 3



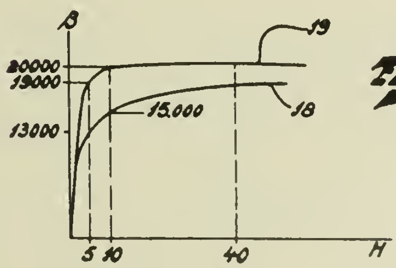


Fig. 4

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Fig. 5

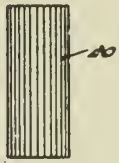


Fig. 7

Fig. 6

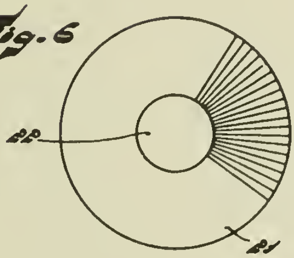
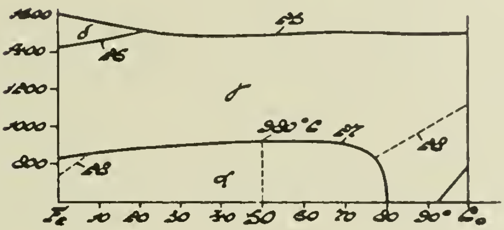


Fig. 8



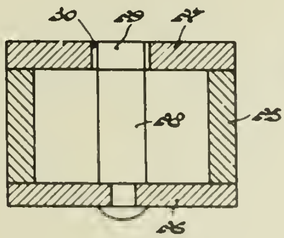


Fig. 9

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ALIEN PROPERTY CUSTODIAN

CATALYTIC CRACKING OF HYDROCARBONS

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No Drawing. Application filed May 6, 1941

The present invention relates to the catalytic cracking of hydrocarbons.

We have found that in the cracking of hydrocarbon oils mainly boiling above 250° C by leading them over rigidly arranged catalysts the yield of low-boiling substances, in particular non-knocking motor fuels, can be increased and the nature of the products improved if the starting materials are passed through more than one reaction zone, the material being introduced into the first zone at an elevated pressure not higher than 25 atmospheres and the pressure being reduced between at least two reaction zones by at least 5 atmospheres, for example by means of regulating valves, without substantially reducing the temperature, the last reaction zone containing synthetic magnesium silicate as a cracking catalyst. At least in the last reaction zone the initial materials are to be completely in a vaporous state.

As initial materials there may be mentioned in particular hydrocarbons rich in hydrogen and capable of being vaporized under the reaction conditions obtained for example from petroleums, destructive hydrogenation products and the like, for example heavy oils which may contain constituents of middle oil character. The hydrocarbon mixtures obtained by the reduction of carbon monoxide are especially suitable initial materials. Hydrocarbons rich in hydrogen may also be worked up in admixture with hydrocarbons lower in hydrogen, in particular aromatic hydrocarbons.

From the initial materials rich in hydrogen there are thus obtained in good yields benzines which are non-knocking and contain comparatively small amounts of unsaturated hydrocarbons because during the treatment there takes place an isomerization of the hydrocarbons which causes a high octane number and high lead susceptibility.

The process according to the present invention is carried out in the first reaction zone at a pressure of from 5 to 25 atmospheres, especially at a pressure of from 5 to 15 atmospheres, and then, without separation of the benzine formed, in the second zone at a lower pressure, preferably at a pressure lower by from 5 to 25 atmospheres than that first used. It is advantageous to work in the last zone under atmospheric pressure. Temperatures of from 350° to 700°, preferably from 400° to 600° C are used and the temperatures in the single pressure stages may be approximately the same. However, the process may also be carried out at increasing temperatures; the increase may amount to from 10° to 100°, preferably from 15° to 50° C.

As has been mentioned above, the last reaction zone, i. e. the one operated at a lower pressure, contains a synthetic magnesium silicate as a cracking catalyst. The said silicate may be prepared, for example, by uniting an acidified water glass solution with a magnesium salt solution, for example a solution of magnesium chloride, washing the resulting jelly or hydrogel and drying and heating it. The magnesium may be dissolved out in part during the manufacture of the catalyst or from the finished catalyst, for example by means of an appropriate acid. The reaction zone operated at higher pressure may be kept free from catalysts and be empty or, if desired, provided only with adsorbing agents, such as for example bleaching earth or alumina or active carbon or inert filler substances, as for instance pumice stone, clay sherds or Raschig rings, or there may be used a less strongly active catalyst, as for example a catalyst which has been used for a long time.

The catalysts are usually used for only a short time, as for example from 20 minutes to 2 hours, and then regenerated, for example with gases containing oxygen, preferably those having gradually increasing oxygen content, at increasing temperature, and then used again, if desired in admixture with fresh catalyst.

The following examples will further illustrate the nature of this invention but the invention is not restricted to these examples.

Example 1

Two reaction chambers connected in series and arranged one above the other are filled with catalysts in the form of pieces, the catalyst in the first chamber consisting of bleaching earth and that in the second chamber of magnesium silicate prepared according to the application Ser. No. 222,144, filed July 30, 1938. The reaction chambers are heated to 460° C. A regulating valve is provided in the connecting pipe. A middle oil obtained from German petroleum and boiling between 250° and 390° C is led in a preheated condition into the upper part of the first chamber, the regulating valve being closed. By reason of the vaporization of the oil, an increased pressure is set up in the first chamber. The regulating valve is then opened in such a manner that a pressure of 20 atmospheres is maintained in the first chamber. The product released from pressure passes then into the second chamber at the same temperature and over the magnesium silicate catalyst. The throughput amounts to 0.5 liter of oil per liter of catalyst per hour.

By working in this way there are obtained 35

per cent of benzine having an iodine value of 40 and an octane number of 72 (Motor method). It is very sensitive to lead and has for example an octane number of 85 after the addition of 0.09 per cent of lead tetra-ethyl. The benzine also has a good stability in storage.

Example 2

An asphalt base petroleum distillate with an initial boiling point of 250° C of which 40 per cent boil up to 350° C is passed at 480° C through a reaction chamber which is filled with lumps of burnt clay; this chamber may be closed by a valve and a pressure of 10 atmospheres is produced in it by the vaporization of the oil which pressure is constantly maintained by the valve. The oil vapors are continuously released to atmospheric pressure into a second reaction chamber which is filled with magnesium silicate synthetically produced, whereby the throughput is 1 liter of oil per 1 liter of catalyst. A reaction product is obtained with 28 per cent of benzine.

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ALIEN PROPERTY CUSTODIAN

DEVICES FOR CONTROLLING POWER CIRCUITS

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Application filed May 7, 1941

This invention relates to devices for controlling power circuits with the aid of a variable resistor hereinafter referred to as resistance circuit breaker. If such resistance circuit breakers are properly designed the switching operation is effected without arcing and without development of vapors.

The invention utilizes this fact and consists in enclosing the resistance circuit breaker in a diffusion-proof gas or vacuum container and in providing the resistance circuit breaker with cooling devices. The known vacuum switches are either not suitable for the purposes of the invention owing to their small interrupting capacity or they necessitate movable bushings, seals or bellows which are very difficult to design. The formation of the arc in the vessel presents a further disadvantage. To restrict the formation of the arc the use of a high vacuum has been proposed which is very expensive to produce and to maintain.

The resistance circuit breaker according to the invention avoids these drawbacks. Owing to the relatively small dimensions the entire switch apparatus together with its driving means may be enclosed in a container even in the case of considerable interruption capacities without the necessity of providing movable parts in the wall of the container. Since the switch device does not develop vapors and also the heat developed therein may be kept within moderate limits with the aid of suitable cooling devices, the air-tight housing may be easily carried out without the heat developed in the housing by the resistor being detrimental. In this case the container may be exhausted to a moderate extent or filled up with a suitable gas. The air-tight housing presents also great advantages if the driving device is partly arranged exteriorly of the container. By the use of an air-tight housing the contact surfaces of the resistor are free of dust, which is of great importance to a sparkless functioning of such devices.

Such a resistance circuit breaker may be employed in shops exposed to risk of explosions or in chemical works in which the air contains gases detrimental to the circuit breaker. It is, therefore, also suitable for places exposed to the risk of fire damp and the like.

In the accompanying drawing is shown an embodiment of the resistance circuit breaker according to the invention in diagrammatic form. In the air-tight container *a* is arranged the resistance circuit breaker *b* consisting substantially of a resistor *w* and of a movable contact *s*. C denotes the driving magnet for the resistance circuit breaker *b*. The points of the container wall through which pass the current supply conductors *l* are vacuum-tight. In the container is arranged a cooling coil *k* filled up with the cooling medium which is in communication with a cooler arranged exteriorly of the container. The cooling medium conduits *r* are connected also to the cooling channels of the resistor *w* or of its support so that the heat developed in the resistor is carried off very efficiently.

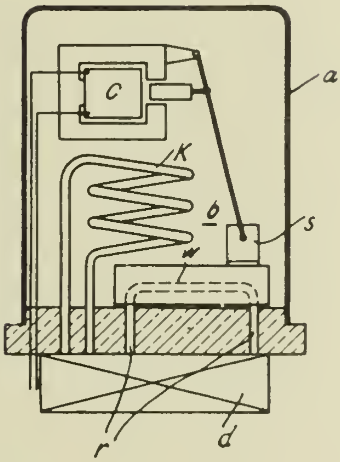
It is also possible to cause the gas in the container to circulate and to thus transfer the heat developed in the resistor to the surface of the container or to a cooler, from where it is dissipated to the outside. The cooling of the container may be dispensed with if the cooling of the resistor *w* is sufficient for the dissipation of the heat.

FRIEDRICH GIEFFERS.

PUBLISHED F. GIEFFERS Serial No.

MAY 18, 1943. DEVICES FOR CONTROLLING POWER CIRCUITS 392,280

BY A. P. C. Filed May 7, 1941



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By his Attorneys Knight

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ALIEN PROPERTY CUSTODIAN

PUSH-PULL AMPLIFYING SYSTEMS FOR ULTRA-HIGH FREQUENCIES

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Application filed May 9, 1941

The invention relates to an amplifying system for ultra-high frequencies which comprises two amplifying systems in push-pull connection which are each constituted at least by a cathode, a control grid, a screen grid and an anode and it has for its purpose to provide means for neutralizing in such a system the retroaction of the anode voltage on the control-grid circuit.

With the usual broadcast frequencies this retroaction is almost exclusively caused by the anode-control grid capacity C_{ag}. With higher frequecies the self-inductions and the mutual inductions of the supply conductors leading to the tube electrode also play a part with the result that the phenomena become much more complicated. However, for these higher frequencies, the retroaction may still be imagined to be brought about by a capacity C_{ag}' which is operative between the anode and the control grid and for which we may write

$$C_{ag}'=C_{ag}-\omega^2 A$$

in which equation ω represents the angular frequency of the oscillations to be amplified and A is a constant determined by the construction of the tube.

It may be seen from the above equation that for every amplifying tube there exists a critical frequency for which $C_{ag}=\omega^2 A$ and there consequently occurs no retroaction at all. With the tube AF3 this critical frequency amounts, for example, to about 20 megacycles per second. For frequencies above the critical frequency there occurs between the anode and the control grid a negative capacity the value of which may be considerably larger than that of the static anode-control grid capacity C_{ag}.

With screen-grid tubes the static anode-control grid capacity is as a rule very slight (for example about 0.003 $\mu\mu$F) so that at frequencies below the critical frequency there is in general no need for neutralization of the retroaction. At frequencies exceeding the critical frequency, however, the retroaction may be very appreciable also with screen-grid tubes. Fundamentally it would in this case be possible to neutralize the retroaction by artificially increasing the anode-control grid capacity, that is to say by arranging a regulable condenser between the anode and the control grid and by adjusting this condenser in such manner that the resulting capacity between the anode and the control grid is equal to ω^2A. In practice, however, this method cannot be carried into effect since an adjustable condenser of the very low capacity required therefor is impracticable.

It is known to neutralize the retroaction with a push-pull amplifying system by connecting the anode of each of the amplifying tubes via an adjustable condenser to the control grid of the other tube. This known method only permits, however, to neutralize a positive anode-control grid capacity so that with frequencies exceeding the critical frequency it is impracticable.

The invention has for its object to provide means for neutralizing the retroaction in a push-pull amplifying system, with which the frequency of the oscillations to be amplified exceeds the critical frequency.

According to the invention, the retroaction exerted by the anode voltage on the control-grid circuit is neutralized in each of the amplifying systems by connecting a point of the circuit of one of the other electrodes of the amplifying system in question through an adjustable condenser to the anode of the other amplifying system, a self-induction being present in the high-frequency connection between the said point and the mid-point of the input circuit.

Preferably, a point of the screen-grid circuit of each of the amplifying systems is connected through an adjustable condenser to the anode of the other amplifying system.

The invention will be explained more fully with reference to the accompanying drawing which represents, by way of example, two embodiments thereof.

Fig. 1 represents a push-pull amplifying tube **1** comprising two amplifying systems the upper one of which consists of a cathode **2**, a control grid **3**, a screen grid **4**, a suppressor grid **5** connected to the cathode and an anode **6** whilst the other amplifying system consists of similar electrodes denoted by primed reference numerals. In order to reduce to a minimum the self-induction of that part of the cathode lead which carries alternating current, which self-induction gives rise to damping of the input circuit, the two cathodes **2** and **2'** are preferably formed as one unit or connected to one another by means of a conductor which is as short as possible.

An input oscillatory circuit **7** is connected in phsh-pull connection to the control grids **3** and **3'**. The oscillations to be amplified are supplied to terminals **8** and **9** and inductively transmitted to the circuit **7**. Between the anodes **6** and **6'** is provided an output oscillatory circuit **10** the ends of which are connected, through the intermediary of separating condensers, to output ter-

minals 11 and 12. The mid-point of the circuit 7 and the mid-point of the circuit 10 are connected to the cathodes 2 and 2′ through condensers which form a short-circuit for the frequency of the oscillations to be amplified.

The anode 6 of the upper amplifying system is connected through an adjustable neutralizing condenser 13 to the screen grid 4′ of the lower amplifying system whilst the anode 6′ of the lower amplifying system is connected through a similar condenser 14 to the screen grid 4 of the upper amplifying system. Between the screen grids 4 and 4′ and the cathode are provided self-inductances 15 and 16.

If the frequency of the oscillations to be amplified exceeds the critical frequency of the amplifying systems the exact adjustment of the condensers 13 and 14 permits to neutralize the retroaction completely.

The function of the inductances 15 and 16 may also be performed by the natural self-inductions of the supply conductors of the screen grids 4 and 4′ as is shown in Fig. 2. To that end the two screen grids must each be provided with two separated supply conductors, each screen grid being connected through one of these supply conductors to the cathode of the amplifying system in question and through the other supply conductor via a neutralizing condenser to the anode of the other amplifying system.

The operation of the systems according to Figs. 1 and 2 will be explained more fully with reference to Fig. 3 which represents a simplified substitution diagram which only exhibits the principal impedances which play a part in the production and in the neutralization of the retroaction. This substitution diagram applies to one of the amplifying systems; for the other amplifying system may naturally be plotted a similar substitution diagram.

In Fig. 3 the anode-control grid capacity is denoted by C_{ag}, the anode-screen grid capacity by C_{as} and the screen grid-control grid capacity by C_{sg}. That portion of the input impedance which is located between the control grid 3 and the cathode is denoted by Z_i whilst C_n denotes the capacity of the neutralizing condenser 14.

For the system according to Fig. 1, L_1 is the natural self-induction of the supply conductor of the screen grid 4 whilst L_2 denotes the self-induction of the coil 15. With the system according to Fig. 2, $L_1=0$ whilst L_2 represents the natural self-induction of the supply conductor of the screen grid 4, which conductor is connected to the cathode. The anode alternating voltage of the upper amplifying system is denoted by E_a, that of the lower amplifying system by $-E_a$. The arrows indicate the direction of the currents flowing in the various impedances.

The substitution diagram according to Fig. 3 is in so far incomplete that in practice also the self-inductions of the supply conductors leading to the suppressor grid and the cathode and the capacities of these electrodes with respect to the anode, the screen grid and the control grid as well as the mutual inductions of the supply conductors may play a part. These impedances, however, are in practice of less importance.

The impedances of the capacities C_{ag}, C_{as}, C_{sg} and C_n are in practice high with respect to Z_i and to the impedances of the self-inductances L_1 and L_2. With complete neutralization the voltages E_a and $-E_a$ cause no voltage on the control grid so that the control grid alternating voltage may be assumed to be equal to zero.

Roughly stated the following values of currents and voltages may be assumed.

A current $j\omega C_{ag}.E_a$ flows through the capacity C_{ag} to the control grid.

Through the capacity C_{as} flows to the screen grid a current $j\omega C_{as}.E_a$ which sets up across the self-inductances L_1 and L_2 a voltage

$$-\omega^2 C_{as}(L_1+L_2).E_a$$

This voltage furnishes a current flowing to the control grid through the capacity C_{ag}, which current is equal to $-j\omega^3 C_{as}C_{ag}(L_1+L_2).E_a$ and consequently in counterphase with the current flowing through the capacity C_{ag} to the control grid, but is larger than the last-mentioned current since the frequency of the oscillations to be amplified exceeds the critical frequency.

Through the capacity C_n flows a current $-j\omega C_n.E_a$ which sets up across the self-inductance L_2 a voltage $\omega^2 C_n L_2.E_a$. This voltage furnishes a current to the control grid through the capacity C_{ag}, which current is equal to $j\omega^3 C_n C_{sg} L_2 E_s$ and is consequently in phase with the current flowing through the capacity C_{ag} to the control grid.

If $C_n L_2$ is made equal to $C_{as}(L_1+L_2)$ the retroaction exerted through the screen grid is completely suppressed so that there only remains the retroaction exerted via the small capacity C_{ag}. If it is desired to neutralize also the latter retroaction, C_n has to be taken slightly smaller. For the case of Fig. 2 it is consequently necessary to take for neutralization C_n equal to or slightly smaller than C_{as}.

In the circuit arrangements according to Figs. 1 and 2 a point of the screen-grid circuit of each of the amplifying systems is connected through a neutralizing condenser to the anode. Fundamentally it is also possible to choose therefor a point of the circuit of another electrode, for example of the cathode. In practice, however, the latter method is not recommended since in connection with the input damping brought about by the self-induction of the cathode lead this self-induction is preferably kept as small as possible.

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Fig. 1

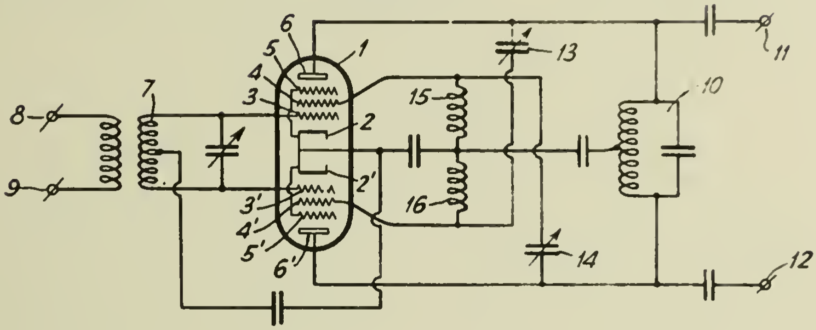


Fig. 2

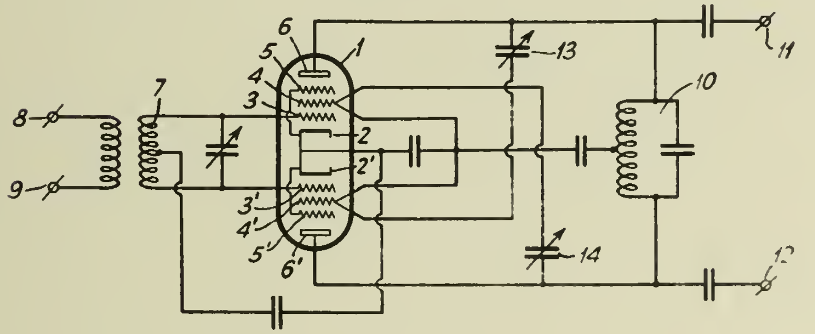
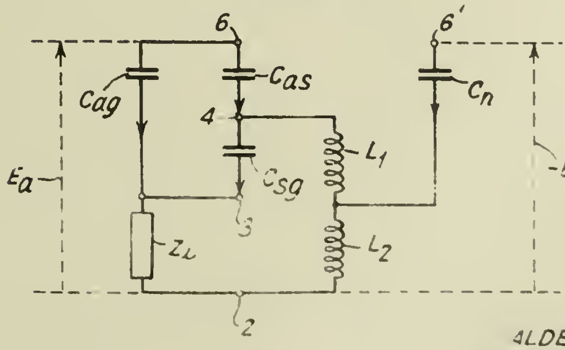


Fig. 3



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AUTOMATIC VOLUME CONTROL DEVICE

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In some directional receivers, for instance, receiver systems comprising a plurality of directional antennae for short wave transoceanic reception, an amplitude-controlled RF, IF, or AF amplifier is required in which the phase between the input potential and the output potential remains constant for the entire control range, that is, for all amplifications. This is difficult to achieve because of the fact that during the control action the internal resistances of the amplifier tubes and possibly also their capacitances fluctuate with variations in the space charge. The effect of the control action, or regulation of the grid biasing potential, alters the tube characteristics and thus the phase, particularly if tuned grid and plate circuits are employed, as is usually the case in IF and RF amplifiers. On the other hand, the slightest phase variation between the signal energies brought together from a number of receiving antennae and associated receivers results in very unsatisfactory distortion. This is especially noticeable in navigation systems and long-distance short wave systems such as the Musa system.

Conditions must thus be made so that even very small phase shifts do not occur in the receiver. It is, therefore, an object of my invention to provide means for preventing the occurrence of phase shifts as far as possible, and throughout the entire control range.

It is another object of my invention to provide means for avoiding large amplitude variations in the medium and short wave bands of reception, and, generally speaking, to overcome the effects of fading phenomena.

According to the invention, in a directional receiver having an automatic volume control device for regulating the amplification of the tubes, I provide an auxiliary tube the plate-cathode path of which is connected in parallel relationship to the plate-cathode path of each tube which is to be regulated by means of a volume control potential. The control grid of this auxiliary tube is variably biased in a sense opposite to that of the usual A. V. C. circuit. The control bias is so chosen as to avoid variation in the total internal resistance of the tubes connected in parallel. The result is that a phase shift of the output potential with respect to the input potential is precluded.

My invention will now be described in more detail, reference being made to the accompanying drawing wherein

Figure 1 shows a preferred circuit organization; and

Fig. 2 shows a modification.

Referring first to Fig. 1, an amplifier tube 1 has its control grid 2 connected to a source of RF potential to be amplified, this potential being fed through the tuned circuit 3. The volume control potential is fed by way of resistance 4 to the lower point of the oscillatory circuit, as is usual. The amplifier tube 1 has a plate-cathode path connected to the tuned circuit 5 which is coupled to the grid circuit of the following stage 6. If desired, an input rectifier for an RF or IF stage may be connected with circuit 5, although this has not been shown in the drawing.

In parallel relationship to the plate-cathode path of tube 1 is connected another tube 7 which of itself acts like a variably controlled resistance. The control grid 8 is connected through resistor 9 to the potentiometer h the voltage drop across which depends upon the output potentials from the amplifier 6 after rectification in the device 10. This same device also supplies rectified potentials to the potentiometer d. The junction between potentiometers d and h is connected to the negative side of a direct current biasing source 11. A potentiometer 12 is connected across the terminals of the source 11 and has a grounded tap for adjusting the steady D. C. bias on the two grids 2 and 8.

The A. V. C. action on grid 2 of tube 1, as obtained through the tap on potentiometer d is exactly opposite to that which is applied to grid 8 of tube 7, since the grid 8 derives its control bias from the tap on potentiometer h. What is thus obtained is that, for instance, with increasing internal resistance of tube 1, the internal resistance of tube 7 decreases. The same holds true as far as a possible capacitance variation of the plate-cathode paths in the two tubes 1 and 7 is concerned. In other words, the capacitance variations of these two tubes are caused to vary in an opposite sense.

The circuit organization of the invention may be carried into practice, for instance, by choosing tubes 1 and 7 of the same type. It can then be easily understood that for small amplification variations the required symmetric variations of the internal resistances and capacitances of tubes 1 and 7 are actually fulfilled. But for large control ranges it is not always possible to obtain or even to expect symmetric variations of the tube characteristics. For this reason tube 7 is either chosen of such type in comparison to tube 1 that in proximity to a certain grid biasing point the characteristics are symmetric in opposite senses. As an alternative, it may be desirable to choose

values for the resistances d and h, and to adopt tubes the properties of which differ in such a manner that symmetric compensation in opposite senses results.

Variable resistance 12 serves for the joint zero-point shifting of the basic grid biasing potentials of both tubes.

Referring now to Fig. 2, I show a modification in which the discharge tube 21 is provided with a novel input circuit arrangement designed to compensate for variations in its grid-cathode capacitance. This input circuit leading to the grid 22 derives signal potentials across the transformer 23 the secondary of which may be tuned by means of the variable capacitor 24. The D. C. bias potential for the grid 22 is derived through resistor 25 and potentiometer d one end of which is connected to the negative side of the D. C. source 11. This source has connected across its terminals a potentiometer 12 having an adjustable grounded tap, the same as shown in Fig. 1 and for the same purposes.

In parallel with the signal input circuit arrangement for the tube 21 I provide a space discharge path consisting of a discharge tube 26. This tube has a grounded cathode, a grid 27, and an anode 28 fed with positive D. C. potential from the D. C. source 29 through the choke 30. The anode 28 is also coupled across capacitor 31 to the grid 22 of tube 21.

In order to provide a desirable adjustment of phase of the A. V. C. control potential on the grid 27 a combination of resistors 32, and 33 with a capacitor 34 is used. The tap on potentiometer d is connected to one end of resistor 32. Resistors 32 and 33 are interconnected and their junction is coupled across capacitor 35 to the grounded cathode of tube 26. The grid 27 is connected to the junction between resistor 33 and capacitor 34. The other side of this capacitor is connected to the anode 28. As is well known in the art, the use of a capacitive coupling to the anode and a resistive and capacitive coupling to the cathode results in phase rotation of the potential applied to the junction between the resistive and capacitive elements 33 and 34 respectively. Hence the tube 26 is controlled in a 90° phase relation to that of the potentials applied to the grid 22 of tube 21. The 90° phase relation between the conductive states in tubes 26 and 21 tends to compensate for capacitive variations between the cathode and grid of tube 21, the compensating potential being impressed across the capacitor 31.

The A. V. C. lead, as will be noted, is preferably connected both to the grid 22 of tube 21 (across resistor 25) and to the grid 27 of tube 26 (across resistors 32—33). The A. V. C. action may, however, be made the same or different with respect to the two tubes, the necessary adjustment being provided by the selection of values for the two resistors 25 and 32 respectively. Hence the most favorable characteristics or working points of the two tubes may be obtained for insuring exact compensation. For example, when the negative volume control potential increases, the grid-cathode capacitance of tube 21 tends to increase as a result of the increased space charge, while the capacitance acting between the plate and cathode of tube 26 decreases with a leveling off of the characteristic slope in this tube.

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Fig. 1

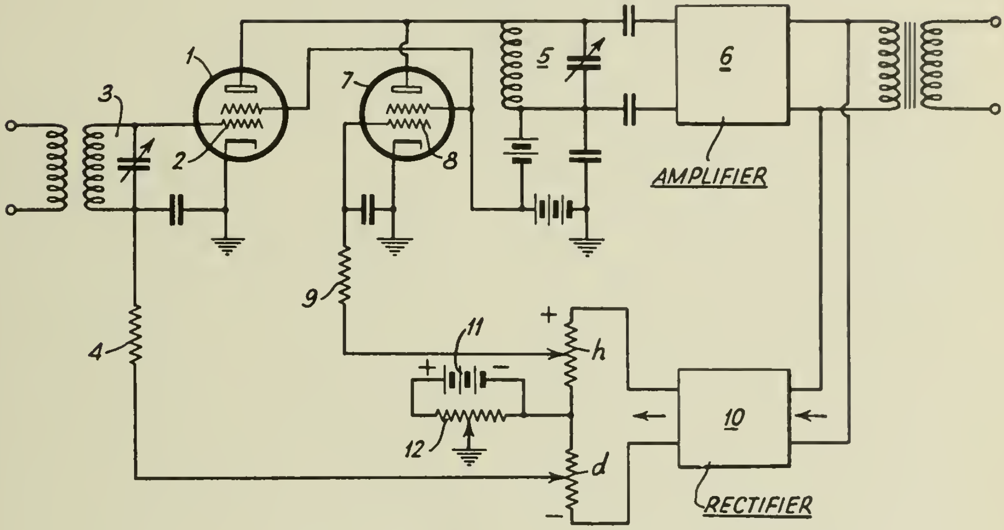
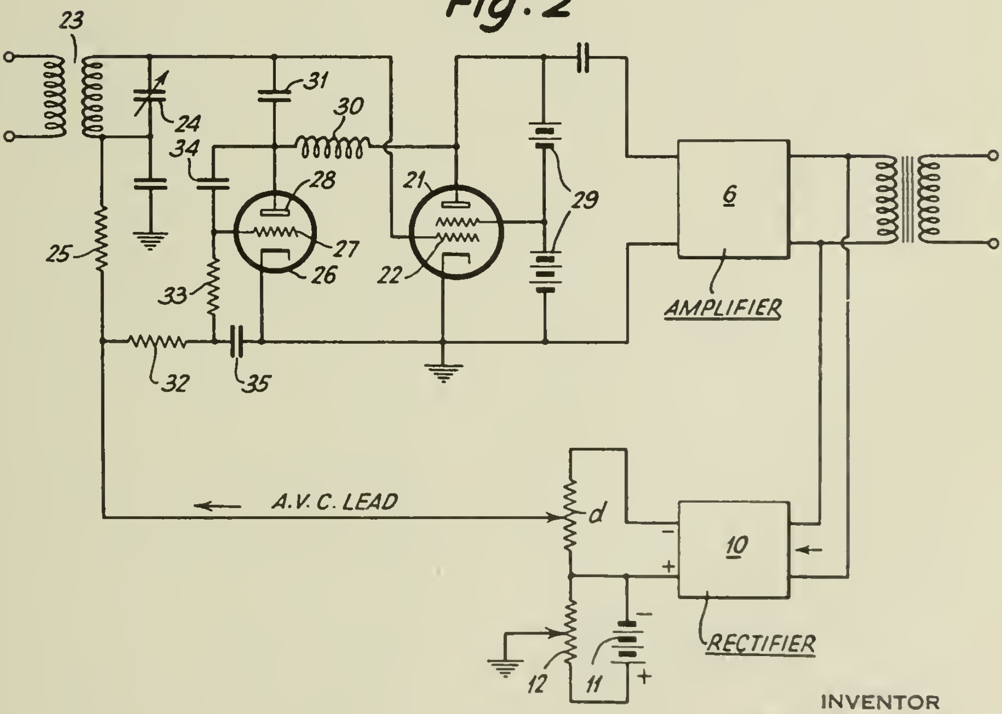


Fig. 2



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SEPARATING THE COCOA SEED FROM THE COCOA BEAN

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This invention relates to separating the cocoa seed from the cocoa bean.

Attempts have heretofore been made to separate the seeds of the cocoa bean material, but these have not been entirely satisfactory, and the object of this invention is to provide a method for such separation, whereby a substantially total separation can be accomplished by relatively simple means.

The invention consists in the method of separating cocoa bean material particles from uncleaned or partially cleaned cocoa seeds and recovering the cocoa bean material, which consists in subjecting a mixture of both cocoa bean material and cocoa seeds to the action of a salt solution, in the proportion of 3:10, whereby due to the relative specific gravity and relative viscosity, the cocoa bean seeds settle to the bottom of the bath, the cocoa bean material or particles segregating on the surface of the solution, and then washing said cocoa bean particles or material thus segregated from the seeds, and then drying such material. The salt is preferably cooking salt, that is sodium chloride, not necessarily chemically pure, nor refined, to avoid the higher cost of the same.

The invention will be more carefully described hereinafter, with the aid of an example, and will be finally pointed out in the claims.

A cooking salt aqueous solution in the proportion of 3 parts of cooking salt, and ten parts water is prepared. The mixture of uncleaned or partly cleaned cocoa seeds and cocoa bean particles are dropped or injected in this solution, and gently stirred, if desired, and after a short time a separation will take place, the seeds descending to the bottom of the bath, and the desired recovery of the cocoa bean material ascending, and segregating on the surface of the bath. A sieve or similar utensil can be used to drain off the solution from the recovered cocoa material or from the cocoa particles free from the seeds.

These recovered cocoa bean particles are then washed in clean water, and dried, and can then be used in the same manner as standard cocoa beans. The seeds are recovered by draining off the salt solution and collecting the deposits, and then washing in clean water and drying them.

The relative specific gravity and the surface tension of the seeds and particles and the viscosity of the bath in relation to the seeds on the one hand and the cocoa bean material or particles on the other hand, being about this ready separation as described.

An example, by way of illustration, is herewith given:

A mixture of 500 kg. of cocoa seeds and cocoa bean material, in which about 40–42% of bean particles and 59–60% of real cocoa seeds are present, was subjected to the action of a bath in the form of a cooking salt solution of 3:10. A separation of this mixture automatically took place within a short time, about three minutes, the time being shorter when the mixture is first gently stirred for a brief period to enable the solution to contact quicker with the surfaces of the ingredients of the mixture. The cocoa bean material gathered on the surface of the bath, whereas the seeds descended to the bottom of the container. When the separation was completed as far as the ordinary observing of the eye could tell, then the surface accumulations were removed by a sieve and washed clean by clear water and dried. The seeds were separated from the bath solution, washed and dried. Through this simple method 205 kg. cocoa beans material and 285 kg. cocoa seeds, the latter substantially entirely free from bean material, were obtained.

This method is a distinct improvement over and differs from the prior art in this:

It is a known fact that when cleaning the roasted opened cocoa beans, it was found aside from the shells and other waste also some cocoa seeds which, however, are mixed with parts of the cocoa beans. Generally, they are separated by a degerminating-machine. The separation is, however, not complete. Even after having gone through the degerminating-machine various times, the seeds are still mixed with quite a percentage of cocoa bean particles which are similar in form and size to these seeds and consequently cannot pass the sieve. A complete segregation of the cocoa bean particles by passing through sieves seemed therefore practically impossible.

The degermination machines which were necessary until now are thereby not needed any longer. Depending on the quantity of cocoa mixture (cocoa seeds and cocoa bean particles) the degerminating machine could be still used as a preliminary and coarser separation. With this new process however, it is possible to obtain the segregation of the cocoa bean particles from the mixture in a manner and to an efficiency which was up till now not possible.

One can of course vary somewhat the proportion of 3 to 10 and this solution is used, generally, at room temperature. The amount of mixture added to the salt solution is such as to enable a facile separation to take place, that is, there must always be more liquid contents than mixture contents.

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DEVICE FOR REGULATING INTERNAL COMBUSTION ENGINES

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Application filed May 20, 1941

The present invention relates to a device for regulating internal combustion engines and additional devices, such as the ignition device, cooling devices, the auxiliary motor for the charging device, adjustable or self regulating propellers, and regulators for controlling the amount of fuel, the regulators being connected to the internal combustion engine and forming a driving unit therewith.

This application is a divisional application based upon certain subject matter contained in our prior copending application Serial No. 233,728, filed October 7, 1938.

The device according to the invention is adapted to serve various purposes.

For instance, the regulation of those devices the optimum position of which changes in accordance with the engine efficiency, is to be automatically effected in dependence on the weight of the air fed in the unit of time.

Accordingly, it is an object of the invention to provide for an automatic regulation in dependence on the weight of the air fed in the unit of time of such devices that are automatically adjusted to their optimum position in accordance with the engine efficiency.

A further object of the invention is to provide a device which allows a particularly favorable utilization of the fuel reserve of the engine. A regulating device of this type has, for instance, the advantage that aircraft provided with such regulators have a range of flight which is greater than with the use of the hitherto known regulating devices.

A still further object of the invention is to provide a regulating device which operates under all service conditions free of objection and this also, as is required for instance at aircraft arts, in a very great height above the earth.

Another object of the invention is to provide a device which seldom or never requires operation of the pilot.

The regulating device according to the invention, moreover, is adapted also for use in aircraft provided with variable pitch propellers.

Furthermore, the regulating device may be so constructed that the various regulating actions aimed at may be obtained independent on the state of the air.

The hitherto known means for regulating internal combustion engines and additional devices connected thereto generally are satisfactory only for some of the above mentioned requirements.

Now, we have found that all the above mentioned requirements may be fulfilled in a very simple manner by providing a device which operates in dependence on the weight of the air fed in a unit of time during charging and which controls the internal combustion engine as well as any number of additional devices in dependence on the weight of air fed in a unit of time.

The regulator according to the invention may be connected to the ignition device of the internal combustion engine for controlling the time of ignition. It is also feasible to connect the regulator to the cooling apparatus of the internal combustion engine for controlling the amount of cooling medium, or to the adjusting members of an adjustable or self regulating propeller coupled to the internal combustion engine for adjusting the pitch of the propeller blades.

A preferred use of the regulating device consists in connecting the measuring instrument operating in dependence on the weight of the air supplied in a unit of time to regulating means influencing the quantity of fuel fed in a unit of time.

Eventually, the same regulator may simultaneously control the feed of the fuel and the drive of an auxiliary motor for the charging device, of coolers, ignition devices, adjustable propellers clutched to the engine and so on.

We have, furthermore, found, that for carrying into effect the general inventive idea consisting in utilizing the weight of the air drawn in and dealt with in a unit of time for regulating the various devices it is preferable to start from the following mathematical-physical relation:

$$G=C.\sqrt{\frac{\Delta p.}{v}}$$

wherein G is the weight of the air, C is a dimension constant, Δp is the difference of certain pressures of the air in the suction pipe and v is the state of the air, i. e. its specific volume, at one of the points of the pressure differences.

It is also possible to start from the following relation:

$$G=C.\sqrt{\frac{\Delta p.p}{R.T}}$$

wherein G is the weight of the air, C is a dimension constant, p is the pressure of the air, R is the gas constant, T is the absolute temperature, and Δp is the air pressure difference referred to above.

If the regulator is to operate according to the last mentioned mathematical relation, it is recommendable for producing the pressure differences to use a partially restricted tube, for in-

stance a Venturi nozzle, inserted in the suction pipe. The specific volume

$$\frac{R.T}{p}$$

preferably is measured with the aid of a vacuum diaphragm bellows arranged in the air current and is then converted into corresponding control movements.

Instead of the Venturi tube any other well-known measuring instrument may be used. However, Venturi tubes have the advantage that practically no throttle losses occur.

For carrying into effect the above mentioned mathematical-physical relations preferably curve discs, cams or the like are provided, the control surfaces of which are formed according to a logarithmic and a number value law respectively. By means of such curve discs or cams, the values of the quotient may be converted into values of the sum and into values of differences, respectively, so that for instance auxiliary devices provided with balance beams may be used upon the arms of which act the pressures to be superimposed.

Further features and capabilities of the present invention will be apparent from the following description of the various modifications taken in connection with the drawings.

Various modifications are diagrammatically illustrated by way of example only in the drawings, wherein:

Fig. 1 is a diagrammatic representation of a construction of a regulator for controlling the fuel spray pump,

Fig. 2 is a diagram relating to the regulation,

Fig. 3 is a diagrammatic representation of a detail of the construction of Fig. 1 wherein a gate is provided for adjusting the arrangement to the use of different fuels,

Fig. 4 is a diagrammatic representation of a portion of a regulator construction in which a centrifugal regulator serving as an additional regulating element is positively driven by the internal combustion engine,

Fig. 5 is an elevation of an internal combustion engine coupled to a propeller having adjustable blades,

Figs. 6, 7 and 8 are a plan view, a side elevation and a front elevation, respectively, of details of a special coupling device for the regulator of Figs. 4 and 5, and

Fig. 9 is a diagrammatic representation of a regulator arrangement particularly adapted for regulating the ignition of an aircraft engine, the position of the flaps of the aircraft controlling the flow of cooling air, the pitch of the propeller and the like.

In one of the embodiments shown in the drawings the measuring instrument serving as actuator for the fuel regulation is designed and arranged to respond to the weight of air temporarily fed into the internal combustion engine. Accordingly, the pilot is completely relieved, and the device operates automatically and correctly, because the predetermined quantity of air required for the prefect combustion of a certain quantity of fuel is always supplied. Conversely, a definite weight of fuel per unit of time is allotted to a weight of air just used by the engine per unit of time.

The weight of the flowing gases or of the air may be measured according to the ordinary methods used in physics and in particular used in the ignition art. Preferably, a Venturi tube is used which is inserted in the suction pipe or air intake leading to the internal combustion engine.

For measuring the state of the air, i. e. its specific volume, preferably a diaphragm chamber containing air or a barometer or thermobarometer operating on the same principle may be used.

When using the above mentioned measuring devices as actuator for the associated power converting members, which may be hydraulic pistons or the like, logarithmic curve discs form the return drive for the actuators. When such logarithmic curve discs are used, the power pistons move in accordance with the logarithm values of the cams.

The control members connected to the two measuring devices, which may be a Venturi tube and a bellows preferably are connected to a common balance beam or the like linkage which by way of a further curve disc acts upon the fuel regulator. Furthermore, a device may also be provided which may be actuated automatically or by hand and which allows adjustment of grade settings for the various operative conditions, as for instance half load, full load, overload, or for a definite number of revolutions of the engine. The adjusting device may substantially consist of a toggle lever system.

The embodiment of the invention shown in Fig. 1 further serves to solve the following problem.

In connection with the known single lever devices for adjusting aircraft engines it is usual to provide a position of the lever for cruising load corresponding to 80% of the full load at which the motor is driven with an excess of air, i. e. with a poor or weak mixture. Another position is provided for a 100% output, at which the motor operates with a very rich mixture. This arrangement is disadvantageous, because, if the aircraft is flying in great height and the engine, therefore, due to insufficient charging pressure, has 80% of its full efficiency or output only, and also in still greater heights the pilot must adjust the lever to the position corresponding to 100% output. Therefore in great heights the aircraft can only be driven with a rich mixture, notwithstanding the fact, that in such heights an aircraft engine during a long flight even with the greatest charging pressure could substantially more economically be driven with a poor mixture.

To obviate these drawbacks the device according to the invention is so constructed that as long as the quantity of air drawn in and therefore the engine output or efficiency remains below a predetermined value of the full output, a poor mixture and with increasing output a gradually richer mixture is supplied. The formation of the mixture, therefore, is according to the invention no longer dependent on the position of the efficiency lever, but on the quantity of fuel mixture consumed by the engine. In this manner the pilot may choose any desired charging pressure in a height in which the engine at the very best draws in 80% of the total quantity of air only. The pilot will fly in any case with a poor or weak mixture. To allow the pilot to set a richer mixture in special cases, for instance when fighting, a second lever may be provided in the linkage for influencing the formation of the mixture, or the efficiency lever may be brought into a 110% position in which it allows supply of a richer mixture.

In the embodiment shown in Fig. 1 one cylinder 1 of the motor or any other internal combustion

engines only is represented. The engine is preferably an aircraft motor. Piston **2** is moved up and down in cylinder **1** and is connected by means of piston rod **3** to crank **4** of crankshaft **5**. Cylinder **1** is provided with outlet valve **6** connected to a pipe leading to exhaust **7**. Inlet valve **8** is provided in cylinder **1**. Gear wheel **9** is mounted on shaft **5** and engages gear wheel **10** on shaft **11**. Shaft **11** carries rotor **12** of a centrifugal blower serving as charging device. Fixed casing **13** of the charger is connected by way of pipe **14** to inlet valve **8** and serves to supply combustion air under pressure. Spray nozzle **15** for the fuel extends into pipe **14**. Nozzle **15** is connected to fuel pump **16** constructed as a geared pump, the construction of which is well known and therefore need not be described. The quantity of fuel fed by pump **16** is regulated by lever **17** acting upon a well known control valve of the pump not shown in the drawings.

Air flows into centrifugal blower **12**, **13** by means of Venturi tube **18** open to the outer relative air current and having a narrow discharge end **19**. Venturi tube **18** flares like a diffusor towards the charger up to the width of inlet socket **20**. Tapping points **21** and **22** are provided at the smallest and at the widest part respectively of Venturi tube **18**. Tapping **22** is connected by way of pipe **23** with the interior space **24** of chamber **25**. Diaphragm box **26** formed by a corrugated tube is arranged in the interior space **24** and closed against the outer atmosphere. The interior of diaphragm box **26** is by means of pipe **27** connected to tapping **21**. The difference of pressure occurring at the two tapping points **21** and **22** of Venturi tube **18** due to the flow of air causes expansion and contraction respectively of diaphragm box **26**. Rod **28** is rigidly connected to diaphragm box **26** and is actuated by the contraction and expansion movements of diaphragm box **26**. Two pistons **29**, **30** are mounted on rod **28** and are shiftably arranged in sleeve **31** which in turn is movably arranged in cylinder **32**. Spring **33** tends to press sleeve **31** upwardly. Inlet pipe **33'** and two outlet pipes **34**, **35** for pressure oil are connected to cylinder **32**. Cylinder **32** is furthermore connected by way of channels **36**, **37** to chambers **38**, **39** which are arranged above and below piston **40** respectively. Piston **29** and piston **30** effect in a well-known manner the supply and the discharge of pressure oil into and out of the chambers **38** and **39** respectively, whereby piston **40** is moved upwardly or downwardly. Besides from the position of pistons **29**, **30** the admission and discharge of the pressure oil also depends on the position of sleeve **31** and on the position of the openings provided in sleeve **31**. Piston rod **41** carrying cam **42** is connected to piston **40**. Cam **42** is in the form of a logarithmic curve. Roller **43** bearing against cam **42** is provided at one arm **44** of a bell-crank pivotally mounted on bolt **45**. The end of the other arm **46** of this bell-crank is fork-shaped and engages pin **47** provided at rod **48** rigidly connected to sleeve **31**. In this manner piston **40** controls sleeve **31** in a logarithmic ratio according to the pressure difference of tapping point **21**, **22**. Spring **33** tends to always press roller **43** against curve **42**.

The lower end of rod **41** carries pin **49** engaging fork **50** of balance beam **51** and acting upon the latter. Upon the other arm of balance beam **51**, also having fork-shaped end portions **52**, acts piston rod **53** controlled by piston **54**. Piston rod **53** also carries curve **55** in the form of a logarithmic curve which, however, extends in the reverse direction with regard to curve **42**. Against curve **55** bears by means of roller **56** the one arm **57** of a bell-crank pivoted on bolt **58**. The other fork-shaped arm **59** of the bell-crank engages pin **60** of rod **62** rigidly connected to sleeve **61**. Sleeve **61** is shiftably arranged in cylinder **64** against the action of spring **63**. Cylinder **64** is provided with inlet pipe **65** and two outlet pipes **66**, **67** carrying pressure oil. On the other side of cylinder **64** channels **68**, **69** are provided which in accordance with the position of sleeve **61** and of pistons **70** and **71** slidably arranged in sleeve **61** effect the admission and discharge of pressure oil into and out of chambers **72**, **73** arranged above and below piston **54**, respectively. Pistons **70**, **71** are fixed to piston rod **74** connected to diaphragm box **75** formed by a corrugated tube. Piston rod **74** is controlled by the expansion and contraction movements of box **75**. Box **75** is closed against the outer atmosphere and contains a definite weight of air, whereas atmospheric pressure prevails in space **76** of chamber **77**, surrounding diaphragm box **75**, so that expansion and contraction of box **75** occurs in dependence on the state of air prevailing at a given time.

Rod **39** is linked to the center **78** of balance beam **51**. Since piston **40** due to the control of sleeve **31** transfers to balance beam **51** the logarithm value of the pressure difference at the two measuring points **21**, **22** while piston **54** transfers to balance beam **51** the negative logarithm value of the state of the air, a displacement of rod **79** results corresponding to half the difference of the logarithm value of the pressure difference and the logarithm value of the state of the air. Rod **79** carries another push curve **80** which introduces into the calculation the constants and the number value of the above mentioned formula.

Curve **80** is, moreover, so formed that, as long as the amount of air drawn in and, therefore, the engine output remains below a predetermined value, for instance 80% of the full load, a poor mixture is supplied, whereas at a higher output a mixture gradually becoming richer is supplied. Against curve **80** bears by means of roller **81** the one arm **82** of a bell-crank pivoted at **83**, the other arm **84** of the bell-crank being connected to toggle lever. The toggle lever consists of two links **85**, **86**. Lever **88** is connected at the connecting point of links **86**, **86** and may effect different positions of toggle lever **85**, **86**. The free end of link **86** is connected to lever **17**, and thereby influences as described above the quantity of fuel delivered by fuel pump **16**. Lever **88** may be actuated by a pilot. This either is effected by connecting lever **88** to an emergency lever which is pulled by the pilot in special cases, for instance during fighting, only to allow an enrichment of the mixture in great heights also. Or else by connecting lever **88** to the efficiency lever so that by shifting the latter into the 110% position the toggle lever linkage is influenced and thereby an enrichment of the fuel mixture is effected.

The automatic regulation of the adjustment to a poor and rich mixture, respectively, independence on the mixture dealt with in the engine is effected by the shape of cam **80**, whereas the additional arbitrary control of the mixture is effected by lever **88**.

In connection with the above mentioned devices for regulating the fuel supply in dependence on the weight of the air, the latter may be represented by the following formula:

$$G = F \cdot \sqrt{2g} \cdot \alpha \, \epsilon \sqrt{\frac{\Delta p}{v}}$$

Whereas the accessory value α has quite an unimportant influence on the measuring exactness of the Venturi tube and quickly approaches a constant value with increasing height of flight, the indication by the accessory expansion value ϵ of the Venturi tube is disturbed in an increasing degree with increasing height of flight. It has been ascertained by tests, that between 0 and 5 kilometers of height the value of ϵ for a definite weight of air was reduced for about 3,5%.

To compensate this defect, the influence of the variable value of ϵ is according to the invention taken into consideration. For this purpose prefferably the regulator which is controlled by the alteration of the specific weight of the air is used. This correction is effected by superimposing the control curve of return sleeve 61 of the regulator by the curve for the variable value ϵ. Hereby the amplitude of the regulator depending upon the specific volume of the air increases with increasing height not only in proportion to the increase of the specific volume of the air, but additionally in proportion to the alteration of the value ϵ.

An example of this modified construction according to the invention is shown in Fig. 1 in connection with Fig. 2 which graphically represents the curve of the value of ϵ mentioned above and of the logarithm of v in dependence of the way of regulation.

In this modified regulator construction piston rod 53 carries a curve 55 which according to Fig. 2 consists of a logarithmic curve corresponding to the expansion characteristic of the box 75, whereby a curve, shaped in accordance with the alteration of the expansion accessory value ϵ is superimposed to this characteristic. Here curve 55 also extends in the reverse direction with regard to curve 42.

Since piston 40 due to the control of sleeve 31 transfers to balance beam 51 the logarithm value of the pressure difference prevailing at the two tapping points 21, 22, while piston 54 transfers to balance beam 51 the negative logarithm value of the state of air under consideration of the value ϵ, rod 79 is displaced so that this displacement corresponds to half the difference of the logarithm value of the pressure difference and of the logarithm value of the pressure difference and of the logarithm value of the state of the air under consideration of the value ϵ.

Lever 88 again may be actuated by the pilot. This is effected either by connecting lever 88 to an emergency lever which is pulled by the pilot in special cases, for instance during fighting, only to allow an enrichment of the mixture in greater heights also. Or else lever 88 may be connected to the efficiency lever in such a manner that the shifting of the efficiency lever into the 110% position influences the toggle lever linkage and thereby enriches the fuel mixture.

The value ϵ depends besides of the height of flight on the load of the motor also. The modification shown and described neglects the alteration which per se is required when the motor load changes. Strictly speaking, therefrom, this modification is correct for a definite motor output only. Practically, however, an additional correction in accordance with changes of the motor output may be obviated, since the correction made is not very great itself and, moreover, is of importance within the limited ranges of the motor output during cruising speed only. If a complicated additional regulation in accordance with the motor output is to be prevented, it may evidently be included in the bargain that certain deviations occur at full load and when the motor runs idle.

Another modification of the present regulator has the advantage, that it may be used for the most different fuels and may very quickly be regulated to the quantity of air required for the particular fuel used. For this purpose, a device for arbitrarily adjusting the quantity of fuel to be supplied is provided in connection with the automatic regulator.

Preferably, this device consists therein that the length of one or more of the lever arms of the regulator linkage is adjustable, one lever of the linkage being provided with a gate in which the pivot point of another lever is arbitrarily shiftable and fixable in any desired position. The arbitrarily adjustable portion of the regulator preferably is connected to an indicating device which indicates on a scale that quantity of fuel which corresponds to the optimum mixing ratio of the fuel in question.

For this device, the construction shown in Fig. 1 may advantageously be used in which between bell-crank 82, 84 on the one hand and fuel pump 16, 17 on the other hand an adjustable device, for instance a device as shown in Fig. 3, is inserted. Otherwise the construction of the regulator may be exactly the same as the one shown in Fig. 1.

Rod 79 carries push curve 80 against which bears by means of roller 81 lever arm 82 pivotally arranged at 83. The other lever arm 84 of this bell-crank acts upon link 185. The other end of link 185 is provided with pin 186 which engages gate 187 in which it may be arbitrarily adjusted and fixed in any desired position. Gate 187 is carried by lever 188 linked to the casing at 189. The other end 190 of lever 188 acts upon lever 17, whereby the quantity of fuel injected by fuel pump 16 is regulated in a well-known manner.

Scale 191 is provided adjacent gate 187. Scale 191 bears the marks for the most favorable adjustment of the air-fuel mixture for different kinds of fuel. So for instance, a mark may be provided for each kind of fuel. Therefore, when changing from one fuel to another it is only necessary to adjust the pivot point 186 of link 185 in gate 187 to that mark which designates the fuel now to be used. Then the motor is at once adapted and without the necessity to effect further time-consuming regulations to operate with the new fuel under the most favorable conditions with regard to the fuel-air mixture.

In a further modified construction the measuring of the weight of the air drawn in and dealt with in the engine in a unit of time is utilized for influencing certain regulator members. This construction is particularly adapted for aircraft engines used to drive propellers and represents the following improvement.

In known devices of this type a definite position of a switch lever is provided for each weight of air, and the quantity of fuel supplied depends on the position of the switch lever. Frequently the pressure of a pump for injecting fuel, for instance into the mixing chamber, is influenced by the regulator. The regulator then correctly operates as long as the fuel pump driven by the engine maintains constant the injection pressure chosen independent of the prevailing engine speed.

Supposing a regulator wherein the weight of air measured in each unit of time is utilized as impulse cooperates with a pump feeding the fuel in dependence of the engine speed and provided with a regulator for the fuel fed, the regulator

being provided with an adjustable regulator member and the pump feeding a definite quantity of fuel determined by the number of revolutions of the engine and the setting of the regulator member. Very unfavorable operating conditions result in this case if an aircraft is to be driven by an engine having different numbers of revolutions with an equal output, i. e. with an equal weight of air.

Such conditions prevail if an aircraft provided with a so-called non-adjustable propeller changes from horizontal flight to climbing. When climbing, the number of revolutions of the engine decreases with regard to the number of revolutions of the engine during horizontal flight. This is due to the low pitch of the propeller. Hereby the feed of the pump is reduced for the same position of the regulator rod so that the correct mixing ratio for the horizontal flight becomes too poor for climbing.

The reverse proportions for instance occur, if the aircraft is pushed or falls. Generally speaking, an undesired change of the mixing ratio occurs with each change of the velocity of the aircraft and with an equal motor output. This is due to the fact that the mixture regulator acts according to a certain time (hourly weight of air), the pump, however, acts on the individual cycle of operation.

The above described difficulties are obviated according to the invention in a simple manner by providing a special regulator. This special regulator is driven in dependence of the number of revolutions of the engine and influences the actual values of the regulation effected by the regulator responding to the quantity of air dealt with in a unit of time so that at all operating conditions the corresponding calculated mixing ratio of air and fuel is warranted. For instance a centrifugal regulator driven by the internal combustion engine is connected by way of its control member to the regulator for the fuel fed by the pump and influenced by the air dealt with in the engine in such a manner that it influences a valve member controlled by this regulator and provided in the fuel pipe.

According to the invention such a device is so constructed that the regulating value of the meter for the air fed into the engine may be corrected in dependence of the engine speed.

According to another modification of the present invention the regulator influenced in dependence of the number of revolutions of the engine is formed as a regulator for the adjustable propeller, the shaft of which is positively coupled to the drive shaft of the pump feeding the fuel. This regulator automatically adjusts itself to a constant number of revolutions in a manner known per se. The special advantage of this construction consists therein that with the use of adjustable propellers provided with regulators for the number of revolutions, it is not necessary to provide a special regulator which for instance corresponding to the construction previously described acts on the control rod for the fuel pump. With this last described construction with adjustable propeller the regulator provided for the propeller effects the regulation of the fuel feed aimed at. The fuel pump need to be regulated according to the temporary quantity only of the consumed air since the number of revolutions of the pump is perfectly constant.

A further modification of the present invention is particularly adapted for aircraft engines with adjustable propellers operating in two speed ranges. When using such adjustable propellers the difficulty may occur similar to that arising in connection with fixed propellers, i. e. that the mixing ratio always will be richer at the higher number of revolutions of the engine than at the lower number of revolutions. This difficulty may according to the invention be overcome by the fact that the regulator, influenced in dependence on the number of revolutions, is arranged as a regulator for the propeller automatically setting to a plurality of constant number of revolutions. Furthermore, control means, for instance correspondingly shaped curve discs, are provided which on setting a range of higher number of revolutions simultaneously and automatically effect an enrichment of the mixture of fuel and air. For example, the second range of number of revolutions of the propeller is chosen so much higher than the first range that the change of the number of revolutions just results in an enrichment from the cruising mixture to the heavy duty mixture. This construction of the regulating device also is characterized by a particularly great simplicity.

When constructing and using the last described device, the regulator is once set to a definite mixing ratio as poor as possible and determined for cruising speed. At the lower number of revolutions this mixing ratio then remains constant at each position of the so-called pilot lever as far as to the 100% position. Only if the propeller is switched to the higher number of revolutions an enrichment also is positively effected so that the engine operates with highest efficiency.

Preferably, the switch lever for the propeller is positively coupled to the pilot lever in such a manner that, on shifting the pilot lever from the 80% position to the 100% position, the propeller also is adjusted to the higher number of revolutions. This modification of the device has the special advantage that by means of a single lever the enrichment as well as the increase of the number of revolutions may be effected. As for the two ranges of operation two ignition points only are required. The device may be improved further by also coupling the switching gear of the ignition device, preferably in the same manner, to the above described multiple switching lever.

Preferably, the various levers are rotatably mounted upon a common shaft and are movably arranged in a common gate provided for engaging and disengaging the levers.

With the present device provided with a regulator for the fuel fed by the fuel pump which may be influenced by pressure differences prevailing in an air measuring device actuated by the engine, the regulator is coupled to an auxiliary regulator. This auxiliary regulator is influenced by alterations of the state of the outer atmosphere, for instance on account of different heights above the earth and correspondingly controls so that the regulating movements of the first regulator are compensated.

As an example of the last described regulating device the construction described in connection with Fig. 1 may again be used, certain regulating members and devices being constructed and arranged in accordance with Fig. 4.

Spraying nozzle **215** is not provided in the air suction pipe leading to the cylinder, but in the cylinder cover. Supply pipe **216** for the fuel is connected to nozzle **215**. The other end of pipe

216 is connected to the outlet socket of feed pump 297 which may be a geared pump.

By means of roller 281 lever arm 282 of a bell-crank pivoted on bolt 283 bears against curve 280. The other arm 284 of the bell-crank is fixed to a toggle lever consisting of two links 285, 286. Lever 287 acts as the connecting point of link 285, 286. Axially displaceable member 288 for instance a sleeve, is arranged on lever 287.

Two weights 294, 295 of a centrifugal regulator bear against member 288. Spring 290 tending to move sleeve 288 downwardly bears against rod 289 fixed to sleeve 288 and displaceable axially with sleeve 288. Spring 290 bears with its other end against link 291 on which two arms 292, 293 are pivoted carrying weights 294 and 295, respectively.

As may be seen from Fig. 4, weights 294, 295 of the centrifugal governor 287—295 driven by the internal combustion engine 1—5 are swung outwardly at higher number of revolutions of the engine so that sleeve 288 is drawn upwardly and therewith link 287 of toggle linkage 285, 286 also is moved upwardly, whereby the length of the linkage is decreased. Consequently, a pull is exerted on regulator rod 296 which tends to withdraw rod 296 from regulator casing 297. The amount of adjustment effected hereby depends on the control movements of bell-crank 282, 284, influenced by curve disc 280, besides being dependent on the control movements of the centrifugal governor. According to the invention the various cooperating gear members are so dimensioned and arranged that the feed movement of regulator rod 296 is compensated again by bell-crank lever 282, 284 by shortening toggle lever system 285, 286 acted upon by the centrifugal governor.

In the construction shown in Fig. 5 the engine block of the internal combustion engine is designated with 300. Pipe 302 is connected to the rear part 301 of the casing. The other end of pipe 302 ends in Venturi tube 303, the open mouth of which faces the relative air current which flows into the mouth as indicated by the arrow. Tappings 304 and 305 are provided on Venturi tube 303 in the same manner as tappings 21 and 22 described in connection with the construction shown in Fig. 1. Pipes connected to tappings 304, 305 lead to regulator 306 which is constructed in a well-known manner and measures the weight of the quantity of combustion air drawn in. Rod 307 projects from regulator 306 which is by means of a link, connected to a further rod 308 which in turn is by a link connected to rod 309. Rod 309 is connected by a link to rod 310 which preferably also acts by way of a link upon rod 311 formed as a regulating rod of fuel pump 312 and movably arranged in the casing of pump 312.

Regulator 313 controlling the number of revolutions is mounted in adjustable propeller 314 journalled upon shaft 315 and driven by the internal combustion engine 300. Regulator 313 is according to the invention so constructed as to change the position of the blades of the propeller in such a manner that the driving engine always rotates with a constant number of revolutions.

Figs. 6–8 illustrate by way of example the coupling of the pilot lever to the selecting lever for the adjustment of the various ranges of numbers of revolutions of the propeller. 316 is the handle of pilot lever 317. The two levers 317 and 321 bear by means of hubs 318 and 320, respectively, against a common pivot 319. Recess 322 facing lever 317 is provided in lever 321. Projection 323 of lever 317 may engage with recess 322 to couple the two levers 317, 321.

The so-called pilot lever as well as the selecting lever for the number of revolutions of the adjustable propeller are movable in common slide 324 provided with slot 325.

As may be seen in Figs. 6 and 8, pilot lever 316, 317 may be moved in slot 325 of slide 324 from point *a* over *b* to c, then to *d* and finally to *e*. In the positions *a* and *e* lever bears against stops which are formed by slot 325 of slide 324.

a designates the idle running position, *b* and *c* designate the cruising positions corresponding to 80% of the nominal output, while *d* is the position for the nominal output and *e* is the position for take off output.

On shifting pilot lever 316, 317 from the position *c* to the positions *d* and *e* selecting lever 321 is entrained by nose 323 which engages with recess 322. Hereby selecting lever 321 is moved from the position *c* (see also Fig. 5) which corresponds to the low number of revolutions of the propeller into the positions *d* and *e* which correspond to the high number of revolutions.

If levers 316, 317 and 321 are not coupled to each other, selecting lever 321 always is maintained in the position *c* by means of spring 326, whereas pilot lever 316, 317 may be maintained in any desired position.

Another modification of the present device has the advantage that it may be used for controlling the quantity of the fuel and also for controlling auxiliary devices of the internal combustion engine, as for instance the ignition device, the cooling apparatus, the adjustable propeller and so on. The device is constructed to also operate under the following operating conditions.

If for instance an aircraft is flying in a height substantially above the so-called full pressure height, the engine supplies a certain portion of its full efficiency only due to the reduction of the charging pressure. Supposing for instance, the motor only supplies 50% of its full power during the time the pilot lever occupies the 100% position very unfavorable conditions result in connection with the known devices. For instance, the cooling flaps are completely opened, whereas the engine only supplies half of its full power so that the engine is strongly cooled down and the speed of the aircraft is unnecessarily reduced. Also the time of ignition can not be correctly adjusted as with the 100% position of the pilot lever the times of ignition favorable for full load are set, whereas due to the great height of the aircraft about 50% of the engine efficiency only may be obtained. The same is true for instance for the adjustment of the pitch of the propeller and the setting of other devices.

To obviate these defects, the regulating device according to the invention is so constructed that a time of ignition, different from that required for a smaller quantity of air fed, for instance corresponding to the cruising efficiency is automatically set, when larger quantities of air corresponding to a great engine efficiency are dealt with in a unit of time.

Also the blades of an adjustable propeller are set and the position of the louvers allowing discharge of the cooling air is regulated in such a sense that above a definite height of flight in which the engine cannot operate with highest efficiency because the amount of air drawn in in

a unit of time is too small the cooling flaps cannot longer be completely opened.

In the modification shown in Fig. 9 by way of example only one cylinder **401** is represented of the internal combustion engine used. Piston **402** moves up and down in cylinder **401** and is connected by rod **403** to crank **404** of crankshaft **405**. Outlet valve **406** of cylinder **401** is connected to pipe **407** leading to the exhaust, and inlet valve **408** is provided in cylinder **401**. Gear wheel **409** is mounted upon shaft **405** and engages with gear wheel **410** mounted on shaft **411**. Shaft **411** carries rotor **412** of a centrifugal blower serving as charger, the fixed casing **413** of which is connected by pipe **414** to inlet valve **408** and supplies valve **408** with combustion air under pressure. Nozzle **415** for injecting fuel extends into pipe **414**. Nozzle **415** is connected to fuel pump **416** which is formed for example as a geared pump **416** the construction of which is known and, therefore, this pump need not be described in detail. The quantity of fuel fed by fuel pump **416** is controlled also in a well-known manner by lever **417** acting upon a control valve of the pump which also is well-known and, therefore, not shown in the drawings.

Air is supplied to centrifugal blower **412**, **413** by Venturi tube **418** open to the relative air current. The discharge end **419** of Venturi throat **418** is narrow and flares like a diffusor towards the charger up to the width of inlet socket **420**. At the smallest portion as well as at the largest portion of Venturi tube **418** tappings **421** and **422** respectively, are provided. Tapping **422** is connected by pipe **423** to the interior space **424** of chamber **425**. Diaphragm box **426**, formed by a corrugated tube is arranged in the interior space **424** closed against the outer atmosphere. The interior of bellows **426** is connected by pipe **427** to tapping **421**. The pressure difference occurring at tappings **421** and **422** of Venturi tube **418** due to the flow of air effects an expansion or contraction of diaphragm box **426**. Rod **428** is rigidly connected to bellows **426** and is actuated by its expansion and contraction movements. Two pistons **429**, **430** are mounted in rod **428**. Pistons **429**, **430** are displaceably arranged in sleeve **431** which in turn is displaceably arranged in cylinder **432**. An inlet pipe **433′** and two outlet pipes **434**, **435** for admitting and discharging pressure oil are provided in cylinder **432**. Moreover, cylinder **432** is connected to chambers **438**, **439** arranged above and below piston **440**, respectively, by means of channels **436**, **437**. Pistons **429** and **430** effect in a well-known manner admission and discharge of pressure oil into and out of chambers **438** and **439**, respectively, whereby piston **440** is moved upwardly or downwardly. The admission and discharge of the pressure oil, besides depending on the position of pistons **429**, **430**, depends on the position of sleeve **431** and the openings provided in sleeve **431**. Piston rod **441** carrying cam **442** is attached to piston **440**. Cam **440** is formed in the manner of a logarithm curve. Roller **443** bears against cam **440** and is carried by the one arm **444** of a bell-crank pivotally mounted on bolt **445**. The other arm **446** of the bell-crank is fork-shaped and engages pin **447**, provided on rod **448** rigidly connected to sleeve **431**. In this manner piston **440** controls sleeve **431** according to a logarithm law. By means of spring **433** roller **443** is always pressed against curve **442**.

The lower end of rod **441** carries pin **449** which engages fork **450** of balance beam **451** and acts upon the latter. Piston rod **453** controlled by piston **454** acts upon the other arm of balance beam **451** which also is formed with a fork-shaped end **452**. Piston rod **453** carries curve **455** which also is formed in the manner of a logarithm curve which, however, extends in a reverse direction with regard to curve **442**. Roller **456** bears against curve **455** and is carried by lever arm **457** of a bell-crank, pivotally mounted upon bolt **458**. The other fork-shaped arm **459** of the bell-crank engages pin **460** which is provided on rod **462** rigidly connected to sleeve **461**. Against the action of spring **463** sleeve **461** may be displaced in a cylinder **464** provided with an inlet **465** and two outlets **466** and **467** for pressure oil. Channels **468**, **469** are provided on the other side of sleeve **461**. According to the position of sleeve **461** and pistons **470**, **471** displaceably arranged in said sleeve, channels **468**, **469** effect the admission and discharge of pressure oil into and out of chambers **472**, **473** above and below piston **454**. Pistons **470**, **471** are fixed to piston rod **474** attached to diaphragm box **475**, formed by a corrugated tube. Pistons **470**, **471** are controlled by the expansion and contraction movements of diaphragm box **475**. Diaphragm box **475** is closed against the outer atmosphere and contains a definite weight of air, whereas atmospheric pressure prevails in space **476** of chamber **477** which surrounds diaphragm box **475** so that bellows **475** expands and contracts in dependence on the state of air at a given time.

Rod **479** is linked to point **478** in the middle of balance beam **451**. As piston **440** due to the control of sleeve **431** transfers upon balance beam **451** the logarithm value of the pressure difference existing at the two measuring points **421**, **422**, while piston **444** transfers upon balance beam **451** the negative logarithm value of the state of air, a displacement of rod **479** results, corresponding to half the difference of the logarithm value of the pressure difference and the logarithm value of the state of air. Rod **479** carries a further push curve **480** which introduces into the calculation the constant and the root value of the formula

$$G = C \cdot \sqrt{\frac{\Delta p}{v}}$$

referred to hereinbefore. The one arm **482** of a bell-crank pivoted on bolt **483** bears by means of roller **481** against curve **480**, while the other arm **484** of the bell-crank acts upon lever **417**. In this manner the fuel supply is effected in dependence on the actually consumed weight of air at a given time. Two pistons **485**, **486** are mounted on rod **479**. In correspondence to the position of rod **479**, pistons **485**, **486** are displaced in sleeve **487** shiftably arranged in cylinder **488**. Pressure oil is admitted to and discharged from cylinder **488** by way of inlet pipe **489** and discharge pipes **490**, **491**. Sleeve **487** is provided with openings which substantially correspond to the openings of the cylinder. Cylinder **488** is connected by means of two channels **492**, **493** to chambers **494**, **495** arranged above and below piston **496**, respectively, so that in a manner known per se the position of pistons **485**, **486** as well as the position of sleeve **497** control the position of piston **496**. Piston rod **497** carrying curve **98** is fixed to piston **496**. Roller **499** mounted on arm **500** of a bell-crank pivoted at **501** bears against curve **98**. The other arm **502** of the bell-crank is fork-shaped and engages pin **503** of piston rod **504** which bears against sleeve **487** and displaces

the latter against the action of spring **505**. Rod **497** acts upon a lever, not shown in the drawings, which in a manner known per se effects adjustment of the ignition device, adjustment of the cooling flaps or setting of the blades of a variable propeller. One and the same piston **496** may effect the adjustment of all adjustable devices, but separate devices also may be provided for adjusting each individual device.

By the above mentioned device not only the fuel supply but also the regulation of all devices, the optimum position of which changes in accordance with the engine efficiency, are directly controlled in dependence on the quantity of the fuel mixture consumed by the engine.

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BY A. P. C.

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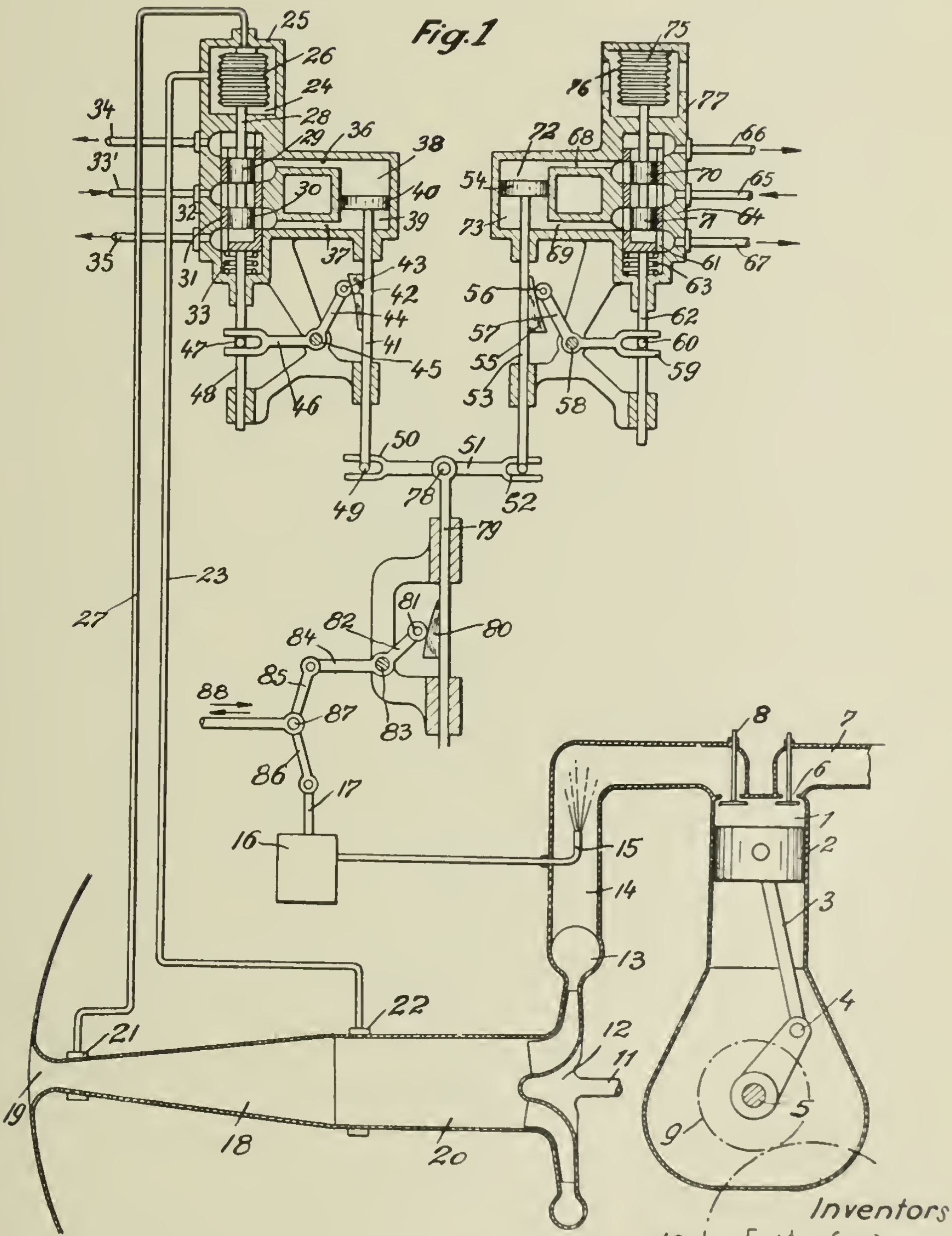
DEVICE FOR REGULATING INTERNAL COMBUSTION ENGINES

Original Filed Oct. 7, 1938

Serial No.

394,324

4 Sheets-Sheet 1



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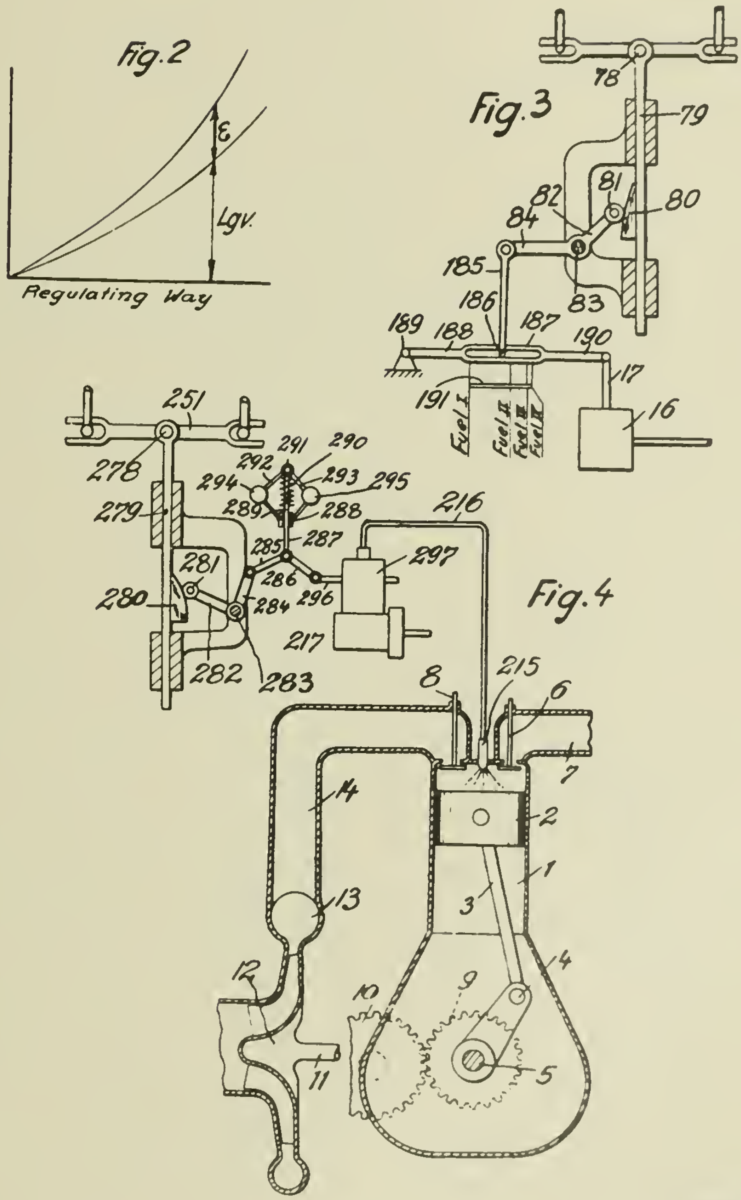

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Fig.5

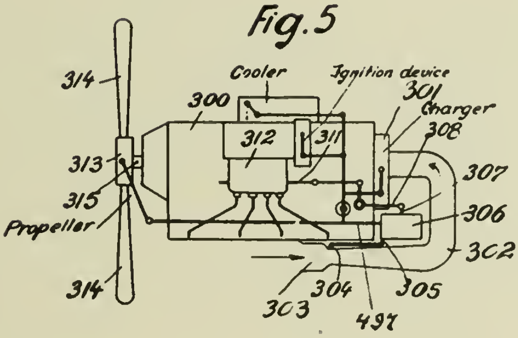

Fig.6

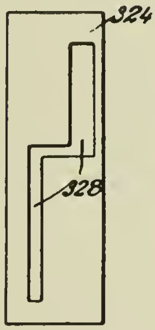

Fig.7

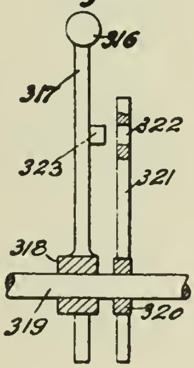

Fig.8

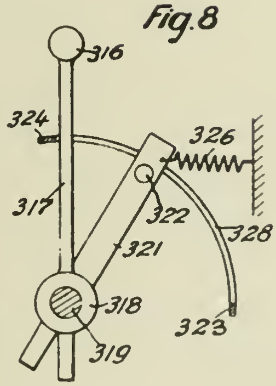

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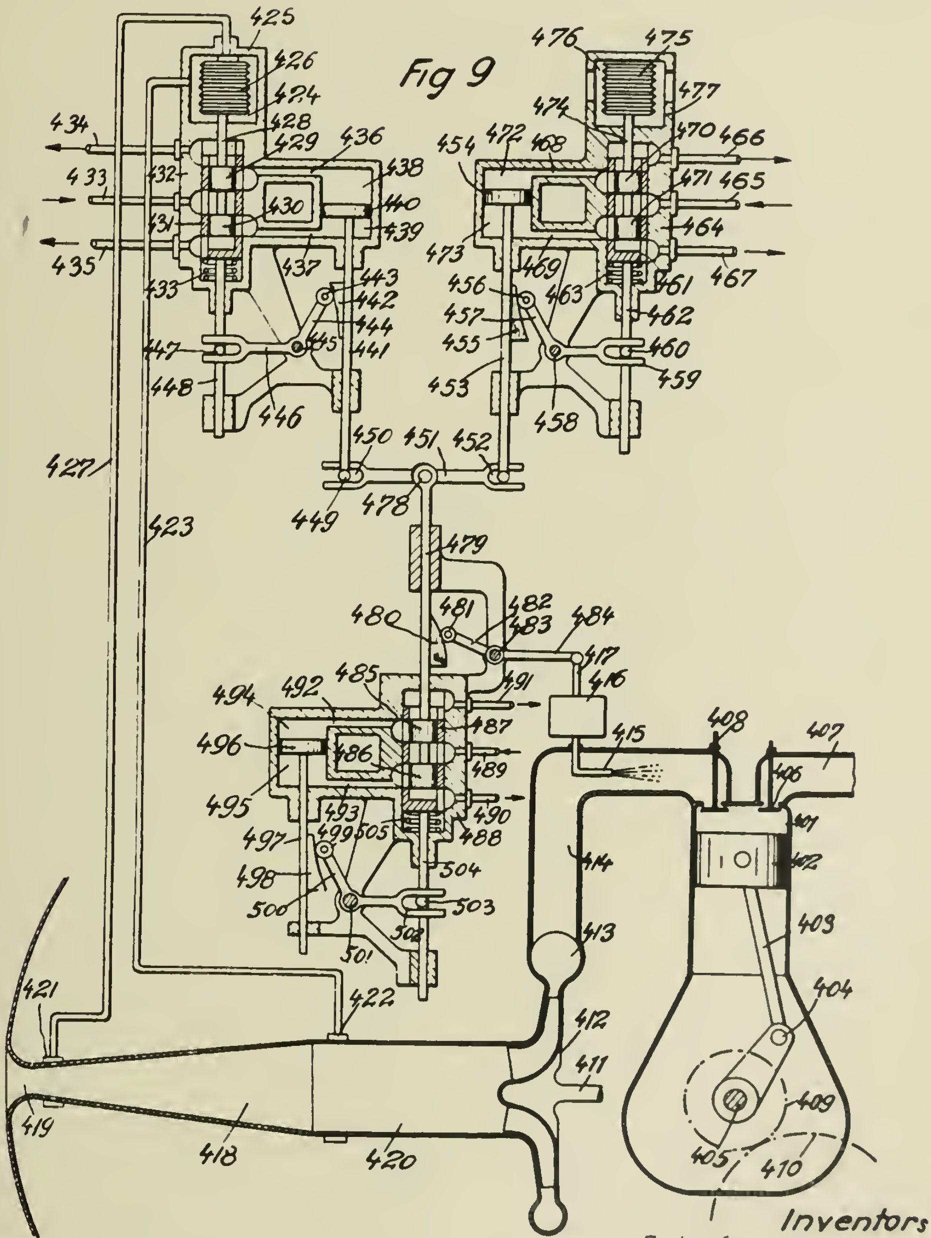
Fig 9



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ALIEN PROPERTY CUSTODIAN

METHOD OF AND DEVICE FOR PRODUCING SOUND BAND MATRICES

Arno Woitscheck, Porz near Köln, Germany; vested in the Alien Property Custodian

Application filed May 26, 1941

It is known to produce sound band matrices galvanoplastically. For this purpose, it has been proposed to provide an original sound band bearing the sound record, for example a wax band, with an electrically conductive surface and then to place it in a galvanic bath, in which a copper deposit is produced on the recorded side of the band, which copper deposit, after having been separated from the original sound band, represents the matrix.

This manner of producing pressing or stamping matrices has the disadvantage of taking up much time and being rather expensive, particularly when it is the question of producing broad sound band matrices with a number of sound tracks running at the sides of each other. It requires comparatively much time until the matrix has acquired the necessary thickness in the galvanic bath.

Further disadvantages of the method described are that, owing to the absolutely necessary current connection at the conductive surface of the original sound band, the galvanically produced matrix will always be narrower than the original sound band, and that the edges of the matrix are not smooth so that both edges of the matrix have to be cut straight. This still more reduces the already smaller width of the matrix and, therefore, it is necessary from the beginning to make the matrix in the galvanic bath considerably wider. Moreover, galvanically produced sound band matrices of copper are too soft for the production of large series of sound bands in a pressing or stamping operation, and it is not at all desirable to use the original matrix for pressing or stamping operations, because, if this matrix is damaged or spoiled, the original record is not available any more. Therefore, it is necessary to use the original matrix for first making a patrix from which one or several pressure-resisting matrices are produced for the pressing or stamping operation. The patrix is produced in a galvanic bath, the original matrix serving as a cathode. The result of this is that, for the reasons given above, the width of the patrix will be still smaller than the already considerably reduced width of the original matrix. The same disadvantage occurs when the matrix intended to serve for the pressing or stamping operation is produced from the patrix. In order to obtain a pressing matrix corresponding to the normal width of the sound band suitable for reproduction, it is, therefore, necessary to produce an original matrix the width of which is equal to about 1½ of the width of the pressing matrix.

The object of the invention is to obviate these as well as other disadvantages of the known method. This is achieved, in the first place, by producing the matrix or patrix band in the galvanic bath so as to have a width only slightly exceeding the width of the sound track bundle and a thickness amounting to merely a fraction of the required thickness, the band obtained in this manner—if necessary, after having its edges worked—being inserted in an unrecorded wider metal band the edge portions of which have the desired thickness of the matrix or patrix, and the central portion of which is provided with an opening corresponding to the cross section of the galvanoplastically produced band.

In this case, there is adopted a measure known in the manufacture of gramophone records consisting in soldering a very thin disc-shaped pressing or stamping matrix, with a thickness of only a few tenths of a millimeter, on to a thick metal plate, in order to protect the matrix against certain influences of the plate material employed, as well as against careless handling by the operator.

The method is advantageously carried out in a manner in which the matrix or patrix band is produced in the galvanic bath so as to have a thickness equal to one half of that required, in a width but slightly exceeding the width of the sound track bundle, the band obtained in this way being fixed to the central portion of a wider, unrecorded metal band of equal thickness, the free edge portions of this metal band being folded round until their edges touch those of the recorded band.

For making pressing or stamping matrices for the production of very large series of sound bands, the invention provides that an original matrix is inserted in a widening band of the type described, the recorded side of the composed band obtained in this manner being coated with an oxide layer, whereupon a patrix having a width equal to that of the total band is produced in a galvanic bath, said patrix—if necessary, after its edges have been worked—being inserted in another widening band, the composed band obtained in this manner being coated with an oxide layer, and, finally, a thick nickelled and chromed pressing or stamping matrix being produced from the composed patrix band in a galvanic bath.

Advantageously, the narrow recorded matrix or patrix band is continuously fed to a uniformly moved, heated widening band, at the same time applying to its recorded side a protective coating

preventing it from tarnishing, and its back being coated with a soldering fat, both bands being pressed together from the place where they come into contact with each other. This part of the method is preferably carried out by means of an arrangement which is provided with a device for continuously folding the edge portions of a uniformly moved, unrecorded band, a device for uniformly feeding and inserting the narrow recorded matrix or patrix band in the channel formed by the folded edge portions of the unrecorded band, a heating device for the unrecorded band disposed between the folding device and the place where the recorded band is fed in, and a device for pressing together the two combined bands behind the feeding-in place. The device for feeding the recorded band may be provided with elements serving to apply a protective paste to the recorded side of the band, and with elements for applying soldering fat to the back of the band. The device for pressing the bands together behind the feeding-in place of the recorded band advantageously consists of individual spring-controlled rollers.

The method forming the subject of the invention is diagrammatically illustrated in the accompanying drawing which also contains a diagrammatical illustration of a device of the type described.

Fig. 1 shows a plan view and a section of a piece of a recorded original sound band;

Fig. 2 is a plan view and a section of the original matrix produced from the sound band according to Fig. 1 after the original sound band has been separated; and

Fig. 3 also shows a plan view and a section of the cut original matrix.

Fig. 4 is a plan view and a section of a piece of a widening band; and

Fig. 5 is a plan view and a section of the widening band according to Fig. 4 with the inserted original matrix according to Fig. 3;

Fig. 6 illustrates the device for inserting the original matrix in the widening band and for producing the latter.

The original sound band, for example, consists of a nitrocellulose band **1** coated with a wax layer **2** into which are cut the sound grooves **3**. After having been recorded, the band is coated with graphite, or its recorded side is provided with some other conductive coating. Thereupon the band is placed in a galvanic bath, the conductive coating of its recorded side being connected to the source of current of the bath. For this purpose, there are provided the indicated clamping devices **4** which pass beyond the edge of the conductive surface layer.

The copper deposit, which is now produced in the galvanic bath, forms a matrix between the clamping devices **4** on the graphite-coated surface of the original sound band, the deposit-forming operation being continued until the thickness of the matrix has reached one half of the thickness required. Then, the matrix is drawn off the original sound band; now it has the shape illustrated in Fig. 2 and is marked **5**. Its edges **6** are irregular; the sound tracks, which in the original sound band had the shape of grooves **3**, are formed by ribs **7**.

Now the matrix **5** which, as mentioned, is only half as thick as necessary or as desired, is cut at its edges. A matrix with smooth edges is illustrated in Fig. 3.

As will be seen from Figs. 1 to 3, the matrix has already considerably lost in width as compared with the width of the wax layer of the original sound band. Its width has been reduced by the galvanizing operation as well as by the working of its edges as compared with the wax layer **2** of the carrier layer **1** of the original sound band. If the matrix according to Fig. 3 would be used to galvanically produce a patrix, and if a matrix would be made of this patrix, the width of the last mentioned matrix would be considerably smaller than that of the original matrix.

In order to compensate the loss of width, the invention provides the use of a widening band. A piece of such a band is illustrated in Fig. 4. It consists of a smooth copper band **8**, whose edge portions **9** are folded round. The band **8** has the same thickness as the matrix **5** according to Fig. 3 and, therefore, in its central portion has half the thickness, and in its edge portions the full thickness of the matrix band to be produced.

Now, the matrix **5** is inserted, with the sound record side out, in the opening formed by the folded edges **9** of the widening band **8**, whereas the back of the matrix is soldered on to the bottom of the opening. This is illustrated in Fig. 5. By the one-piece connection a matrix band is produced which has the desired thickness and a considerably greater width than the galvanically produced matrix band **5**. Nevertheless, only a part of the entire matrix requires to be produced galvanically.

The composed matrix according to Fig. 5 is now provided on its recorded side with an oxide layer, for example by silvering the recorded side and subsequently oxidizing the silver layer in a bath consisting of a solution of iodine and bromine in alcohol. Thereupon the matrix is again brought into the galvanic bath and a patrix is produced therefrom, which, after having been cut at its edges, is also narrower than the matrix. In order to compensate this loss in width, the patrix is inserted in the manner described above in a widening band according to Fig. 4 and is soldered on to this band. The total patrix widened in this way is again coated on its recorded side with an oxide layer and is brought into the galvanic bath, in which a matrix is produced therefrom. This matrix is then wide enough to be used for pressing or stamping sound bands. The presssing or stamping matrix is produced in the galvanic bath either in full thickness or in a fraction of this thickness, in which case it is attached to a band having the missing thickness of the matrix. Finally, the pressing matrix is nickelled and chromed and is then ready for use.

The inserting of the original matrix or of the patrix in the widening band and the soldering together of these two bands is advantageously effected in a device illustrated diagrammatically in Fig. 6. This device comprises a drum **10** upon which is wound the folded widening band **8**; the cross section of this band is illustrated at **11**. A pair of rollers **12** conducts the band to a folding device **13**, in which the edge portions **9** of the band are folded round. After leaving the folding device, the band has the cross section illustrated at **14** corresponding to that of Fig. 4. Thereupon the widening band passes through another pair of rollers **15** behind which it is heated by any desired type of device **16**.

The matrix band **5** is wound at **17** upon a drum and runs over the rollers **18**, **19**, and **20** to the entrance place of the pair of rollers **21**, **22**, between which also passes the widening band **8**.

At 23 a device is indicated which provides the recorded side of the matrix band with a coating serving to prevent the sound tracks from tarnishing under the influence of the heat required for soldering together the bands 5 and 8. The coating is water-soluble and is washed off after the two bands have been soldered together. At 24 is indicated a device for coating the back of the matrix band with soldering fat. The matrix band is inserted through the rollers 21, 22 in the opening of the widening band, and behind the rollers 21, 22 there are arranged spring-controlled individual rollers 25 above and below the two bands 5 and 8, serving to press the matrix band, the back of which is coated with soldering fat, against the heated widening band. After having passed through the system of rollers 25, the bands 5 and 8 are rigidly connected with each other. The cross section of the combined band system is illustrated at 26.

The device illustrated in Fig. 6 is used in a similar manner for inserting and connecting the patrix band in a widening band.

The invention is not limited to inserting a galvanically produced matrix or patrix band, having half the thickness of the matrix or patrix to be produced, in a widening band the central portion of which has the same thickness as the galvanically produced matrix or patrix band; but it is also possible to galvanically produce a matrix or patrix band whose thickness represents a different fraction of the total thickness required, and this band may be inserted in a widening band whose edge portions have the required total thickness of the matrix or patrix, and whose central portion has an opening, the depth of which is equal to the thickness of the galvanically produced matrix or patrix band.

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METHOD OF AND DEVICE FOR PRODUCING SOUND BAND MATRICES

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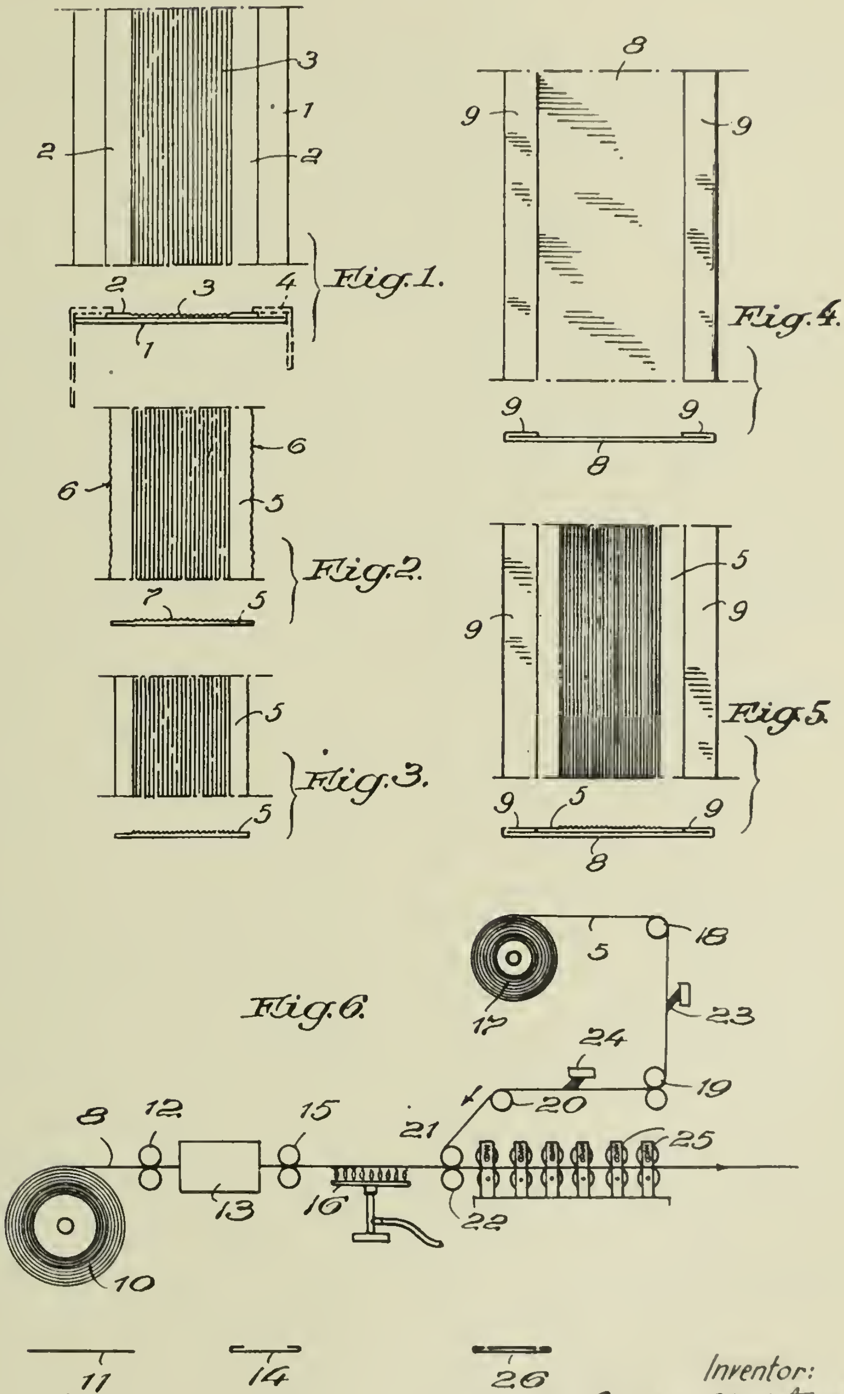

Inventor:
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ALIEN PROPERTY CUSTODIAN

METHOD OF AND DEVICE FOR PRODUCING MATRICES FROM MECHANICALLY RECORDED SOUND BANDS

Arno Woitscheck, Porz near Köln, Germany; vested in the Alien Property Custodian

Application filed May 26, 1941

The object of the invention is to provide, in place of the known method of producing mechanically recorded sound bands in a galvanic bath, a method of and a device for the production of perfect sound band matrices in the most simple manner and within the shortest possible time. It relates especially to the production of matrices from long and comparatively wide sound bands, in whose sound record layer are cut a number of sound grooves running parallel or nearly parallel to the edge of the band, though the invention may likewise be applied to short and narrow sound bands.

The original sound bands, after having been recorded in known manner, are provided with an electrically conductive coating, for example a graphite coating, and are then placed in a galvanic bath, in which a galvanic deposit of the desired thickness of the sound band matrix is produced on the surface of the band that has been rendered conductive. In this operation, not only the handling of the original sound band, which is provided with an extremely sensitive layer, for example a wax layer, but particularly the electric connection of the conductive surface of the band cause considerable difficulties. Since the conductive coating on the recorded side of the band has to be extremely thin, because otherwise the reproduction of the sound record by the matrix would be imperfect, care must be taken that the coating produced in the galvanic bath grows as quickly and uniformly as possible, and at the same time that the band-shaped matrix has in all parts the same thickness.

In order to achieve these objects, the invention provides a current connection at the conductive recorded surface of the original sound band on the entire length of this band, ensuring an uninterrupted contact along the edge of the conductive surface strip, preferably along both edges of this strip. For this purpose, the original sound band is clamped at its longitudinal edges on to a current carrying rail by means of conducting angular strips, the one leg of which rests on said rail, whereas the other leg lies on the edge of the conductive surface of the sound band. The free surfaces of said rail and of the conducting strip serving to clamp fast the sound band are provided with an insulating layer or cover, and then the band is brought into the galvanic bath.

In order to save room and to be able to more easily handle the sound band, it is known to wind the sound band in a helical line upon a drum when it is emerged in the galvanic bath. As a carrier for the sound band, the invention provides, instead of the drum, a helical current conducting rail with clamping devices for the sound band arranged along the edges of the rail. This helical rail is advantageously mounted to rotate and is connected by means of a slip ring to the current lead.

According to the invention, the clamping devices for the sound band comprise segmental sections of angularly bent metal strips which, on the one hand, bear by means of angular segments of insulating material against the current conducting rail and, on the other hand, against the conductive surface of the sound band.

A constructional example of the device for carrying out the method according to the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a view of the device;

Fig. 2 is a section on the line II—II of Fig. 1; and

Fig. 3 is a plan view.

Fig. 4 is a section through the current conducting rail of the device and through the clamping devices for the original sound band in an enlarged scale;

Fig. 5 is a top view of the current conducting rail with the clamping devices attached thereto, also in an enlarged scale.

The current conducting rail consisting, for example, of copper has, as will be seen from the drawing, a helical shape and forms at its outer circumference a smooth resting surface 2 for the original sound band of which a matrix is to be made. The current conducting rail is carried by a cage consisting of an upper ring 3, preferably of copper, a lower ring 4, and rods 5 running between these two rings. The rods 5 pass through the windings of the current conducting rail and serve to carry this rail and to ensure a uniform spacing of the individual windings of the rail; they are conductively connected to the rail 1 and the rings 3 and 4.

The ring 3 is connected by means of spokes 6, preferably consisting of copper, with a hub 7 of insulating material rigidly attached to a vertical shaft 8 rotatable about its axis, a slip ring 9 being provided at the circumference of the hub and being conductively connected to the spokes 6. The current conduction to the slip ring 9 is effected by the diagrammatically indicated brush 10.

The ring 4 has spokes 11 supported by a hub 12 of insulating material, which is carried by the shaft 8 at its lower end.

To the rail 1 are attached at the side at cer-

tain distances bolts 13 of insulating material serving to attach the clamping devices for the sound band of which a matrix is to be made. The bolts 13 carry nuts 14, also consisting of insulating material. The clamping devices for the sound band consist of segmental sections of angularly bent copper strips 15 and of angular segments 16 of insulating material. The copper strips 15 have longitudinal slots 17, and the segments 16 have longitudinal slots 18 in which, in the operating position of these clamping means, the bolts 13 are disposed.

The sound band, of which a matrix is to be made, for example, consists of a carrier layer 19 and a sound record layer 20 of wax, into which the sound grooves 21 are cut. After the recorded surface has been made conducting, for example by coating it with graphite or in some other way, the band is wound upon the outer surface 2 of the helical rail 1 so that the carrier layer rests on the rail. As this winding proceeds, first the copper strips 15 and then the insulating segments 16 are slipped with their slots 17 and 18 on to the bolts 13 of the rail 1, whereupon the nuts 14 are tightened. In this way, the leg 15*a* of the copper strip 15 is pressed against the lateral face of the rail 1, whereas the leg 15*b* projects over the edge of the original sound band and bears against the conductive surface of this band. As will be seen from the drawing, one copper strip 15 follows the other copper strip 15 so that the current connection at the conductive recorded surface of the original sound band is ensured over the entire length of this band by uninterrupted contacts along the edge of the conductive surface strip, at both edges of this strip. Consequently, when the sound band is brought into the galvanic bath, the material forming the matrix, for example copper, very rapidly accumulates on the surface of the band of which the matrix is to be made.

When the sound band is completely attached to the current conducting rail, the remaining free surfaces of the rail and of the conducting strip serving to clamp the sound band on to the rail are provided with an insulating layer or cover. This may be done, for example, by applying an insulating varnish. The same refers to all other conducting surfaces of the ring 4, the rods 5, the spokes 11, and the shaft 8. Of course, all these parts may just as well be varnished before winding the sound band upon the rail.

The device described above, carrying the sound band, is emerged in the galvanic bath 22, into which the anodes 23 dip, in a manner known per se, said anodes being suspended on a conductive ring 24 connected at 25 to the source of current. While the matrix is being formed, the rail 1 is rotated by the shaft 8 with respect to the anodes 23.

When the matrix has been formed, the rail 1 is drawn out of the bath, the clamping devices 15, 16 are removed, and the matrix band formed is detached from the original sound band while the latter is still wound on the rail.

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2 Sheets-Sheet 1

Fig. 1

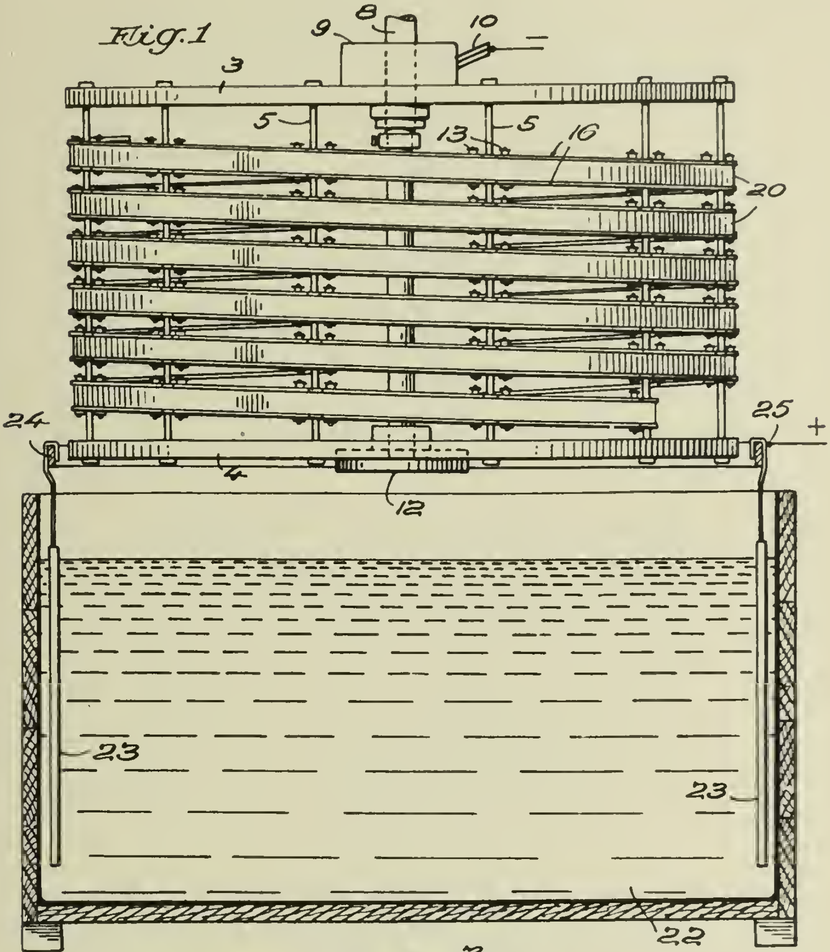
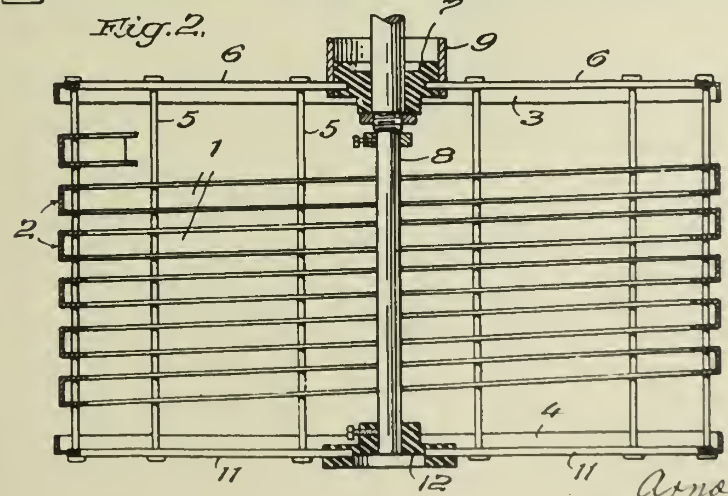


Fig. 2.



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2 Sheets-Sheet 2

Fig. 3.

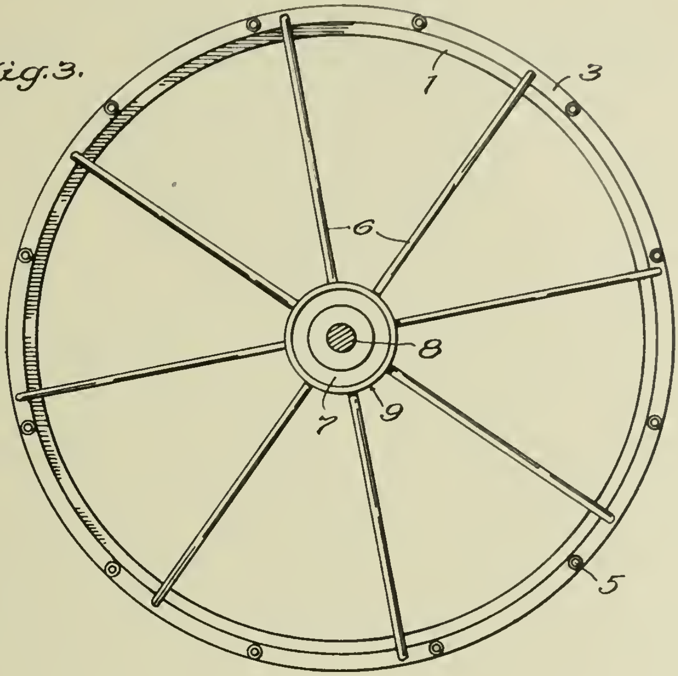


Fig. 4.

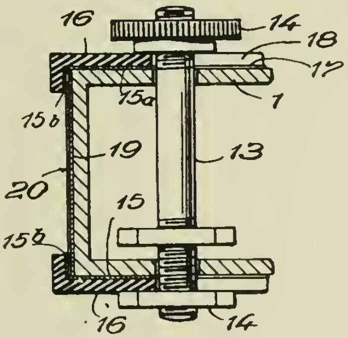
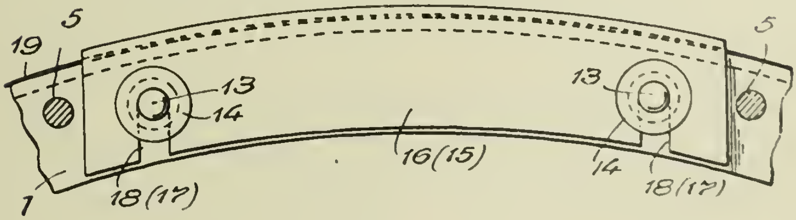


Fig. 5.



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ALIEN PROPERTY CUSTODIAN

METHOD OF CONNECTING AN ELECTRIC CONNECTING LINE, BY MEANS OF A CONDUCTIVE ADHESIVE, TO AN ELECTRODE OF A BLOCKING-LAYER RECTIFIER WHICH CONSISTS OF LOW-MELTING MATERIAL

Nicolaas Willem Hendrik Addink, Johannes Jacobus Asuerus Ploos van Amstel, and Nicolaas Bos, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed May 29, 1941

This invention relates to a method of obtaining a good electrical connection to the electrode of a blocking-layer rectifier, and to the blocking-layer rectifiers provided with an electrical connection obtained by this method.

The blocking-layer rectifiers generally used in technics, such as selenium rectifiers and cuprous-oxide rectifiers. generally have a so-called counter-electrode which consists of a material of good conductivity. In view of obtaining an intimate connection, this electrode is mostly applied as a very thin layer of, say, 100 microns in the liquid state and for this purpose it is most convenient to utilise an alloy melting at low temperature. This alloy is applied, for example, by spraying.

The formation of an electrical connection with this electrode of good conductivity involves difficulty since the thin layer of this electrode is readily damaged and the properties of the rectifier consequently fall off. With the use of a resilient pressure contact, for example, there is a risk of damage and puncture at the contact places submitted to pressure. In patent ——— Patent specification ——— Application Number 304,276 (Ph. 6611) it is suggested to utilise a thin flexible foil or wire as a supply conductor which is metallically connected to the electrode layer. For this purpose the material of the electrode itself is used as a solder.

In establishing such a metallic connection the electrode material located under the contact extremity of the supply conductor is consequently melted, for example, with the aid of a soldering iron.

The method according to the invention has for its purpose to provide a mode of connection which is realisable in mass production with less risk of damage to the underlying blocking layer at the point of fastening. This method is characterized in that the quantity and the nature of the adhesive matches the nature of the under layer at the point of fastening so that the amount of heat energy transmitted to the under layer during fastening is inadequate to affect to an important degree the qualities of the blocking layer at the point of fastening.

Consequently, with the method according to the invention it is avoided that at the point of connection the material of the electrode, if the material is already melted at this point, has heat supplied to it in such measure that also the blocking layer at this point considerably decays in quality. A good measure of this is that the so-called formation process need not be applied anew after the adhesion is established.

With such a formation process known per se the cell is submitted for some time to a strong electric load, due to which the quality of the blocking layer is improved. Now, with the use of the method according to the invention, it appears not necessary to use such a complete formation process after the adhesion of the supply conductor is established.

Several examples of the process according to the invention will now be described more fully by reference to the accompanying drawings.

Fig. 1 shows an example in which the extremity of the supply conductor is so constructed that, when immersed in molten soldering material, a quantity of this solder in the liquid state is retained which is sufficient to establish the weld while on the other hand this quantity in the molten state contains only so much heat energy as is just sufficient to establish the adhesion.

Fig. 2 relates to a form of construction in which a supply conductor containing the required quantity of low-melting solder at the point of fastening is placed on the rectifier electrode while subsequently an amount of heat is supplied which can be easily dosed, for example with the aid of hot air, so that the solder is just melted without an excess of heat energy being supplied.

Fig. 3 illustrates a form of construction which utilises a conductive paste or a lacquer as a connecting agent which is liquefied at a temperature preferably not considerably higher than the ambient temperature and hardens in air.

Fig. 4 shows the result of another example of the method whereby at least at the point of fastening of the supply conductor, prior to the fastening thereof, a layer is applied which consists of conductive material and, if desired, has a higher melting point than the material of the electrode, the melting point of the material of the protective layer and the manner of application. for example by spraying, being so chosen that the blocking layer at the point of fastening remains intact.

Fig 1*a* shows a supply conductor 1 having a contact end 2 formed into a spiral, this formation being effected by bending the thin flexible wire 1 into the form of a flat spiral. From the cross-section shown on a somewhat enlarged scale in Fig. 1b it will be seen that this spiral, after immersion in molten solder, retains a quantity 3 of this material. During the time that this material is still in the molten state, the supply conductor 1 is placed on the electrode

layer 4 of the blocking-layer rectifier, as is shown in elevation in Fig. 1c. The blocking-layer rectifier, of which Fig. 1b is a cross-sectional view, is built up from an aluminium carrier plate 5 on which is a selenium layer 6. Between the carrier plate 5 and the selenium layer 6 there may be one or more additional adhering layers of other materials, for example at first zinc and then carbon, while between the layers 6 and 4 (the electrodes) is a blocking layer. The adhering layers and the blocking layer are, however, not shown for the sake of clearness. For the electrode 4 and the solder 3 use may be made of the same materials. Both of them may consist, for example, of an alloy of tin, bismuth and cadmium which melt at largely 100°. If desired, for the material 3 use may be made of an alloy melting at a somewhat higher temperature. As soon as the supply wire 1, together with the quantity of the material 3, is placed on the electrode 4, the material of the latter electrode is melted superficially, forming an intimate connection. Due to the material 3 containing a limited amount of heat energy, the blocking layer under the electrode 4 at the point of fastening remains perfectly intact and no damage occurs.

If use is made of a supply conductor of different shape, for example a flexible metal strip, the extremity thereof may be foraminated and further one may proceed in the similar manner.

With this form of construction it can already be seen that, in addition, the advantage is obtained that this method of adhesion may be readily used with blocking-layer rectifiers of small size. The same advantage will also be found with the examples which will be discussed hereinafter.

The form of construction of the rectifier of Fig. 2 is shown very diagrammatically in elevation, corresponding parts being indicated by the same reference numerals as in Fig. 1. The supply conductor 7 used in this case is a strip whose extremity is provided with perforations 8. Such a strip may be immersed in soldering material in the manner referred to above and be placed on the electode 4. Now, the figure shows that here the connecting material may first be made to coagulate and later be melted at the point of fastening by supplying hot air from a blow pipe 9. This offers the advantage that use may be made of foils which have been prepared beforehand in large quantity and provided with soldering material. In this form of construction use is made, for example, of a soldering material having a lower melting point than the material of the electrode 4.

This supply of hot air may also be used with the method described with reference to Fig. 1 when the soldering material has cooled down to such extent that, though the state of coagulation is not yet reached, the quantity of heat energy is inadequate to melt the surface of the electrode 4 at the point of fastening. The flow of hot air then gives an additional supply of heat for this purpose.

Fig. 3 again shows a supply conductor 10 whose extremity is foraminated. The connecting agent used in this case is a conductive lacquer or paste 11. This material is obtained, for example, by mixing 30 grs of finely grounded graphite with 100 cc of chlorated rubber lacquer.

The material 11 is applied after the current collector 10 is placed on the electrode 4. The conductive paste is kneaded on it. With the use of a conductive lacquer it may be easily smeared throughout the surface of the electrode 4 so that an even better discharge of current is obtained. The last-mentioned method may also be used in conjunction with the forms of construction described with reference to the other figures.

Since such a paste generally has still a comparatively high resistance, this method is mainly of importance for low-power cells in which the current consumption lies in the order of magnitude of milliamps.

The foraminated contact ends of the supply conductors described in these forms of construction may also be used when the connecting material is applied in a different manner, for example by spraying. In this case the connection between the sprayed layer and the electrode 4 is established through the openings.

The cross-sectional view of Fig. 4a and the associated elevation view of Fig. 4b show that the electrode 4 of the rectifier in this form of construction is provided at the point of connection with a protective layer 12, before the supply strip 13 is fastened. For the layer 12 use may be made of a material having a lower melting point than the material of the electrode 4, if in the manner of application in accordance with the principle of the invention care is taken that the blocking layer remains intact. The application of this protection layer may be effected, for example, by spraying. The higher melting point offers the advantage that the connection with the strip 13 may also be established with the aid of a solder melting at higher temperature. Thus a rigid soldered connection is obtained so that this method is particularly in its place with rectifiers which are heavily loaded, since the risk of the connection being loosened by fusion at high operating temperatures is decreased. If this property is not required, the covering layer may alternatively be made of low-melting material so that the adhesion may also be effected at lower temperature and consequently the risk of damage to the blocking layer is still further decreased.

If the protective layer 12 extends throughout the surface of the electrode 4, an additional advantage is obtained. As has already been mentioned in the introduction, the electrode 4 has in general to be applied as a thin layer, inter alia since for the obtainment of an intimate contact and for the qualities of the blocking-layer alloys melting at low temperature, for example at approximately 100°, thin layers have been found most convenient. If these alloys are applied as a thick layer, difficulty is involved when the rectifier is highly loaded. In this case the material liquefies and contracts in the form of drops or flows away. With the use of thin layers it is found that the rectifier can endure such an overload. If, now, a covering layer is used consisting of a material which only melts at a higher temperature, for example 130° to 150°, then this layer remains intact at a temperature of the rectifier of about 110°. It ensues therefrom that the risk of a decay of the electrical properties of the rectifier in the case of overload is reduced.

In connection with the inventive idea of the present method such a layer will have such thickness (for example 0.1 mm) that a solder contact may be easily formed with it without the heat penetrating to such extent that the material of the electrode proper on the side of the blocking layer is melted.

Particularly with the forms of construction

shown in Figs. 1, 2 and 4 the action exerted on the blocking layer by the amount of heat energy already dosed may still further be limited by carrying away this heat as quickly as possible, after the required flowing of the material at the point of adhesion is obtained. This may advantageously be obtained by placing a metal die on the point of adhesion immediately after the flowing, said die being a good conductor of heat and also pressing the contact during coagulation.

It has been found advantageous to establish the adhesion while a voltage is set up at the cell. This may be set up, for example, with the aid of the supply conductor itself which is to be adhered, or by means of the die referred to above.

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METHOD OF CONNECTING AN ELECTRIC CONNECTING LINE, BY MEANS OF A CONDUCTIVE ADHESIVE, TO AN ELECTRODE OF A BLOCKING-LAYER RECTIFIER WHICH CONSISTS OF LOW-MELTING MATERIAL

Filed May 29, 1941

Serial No.
395,872
2 Sheets-Sheet 1

Fig. 1

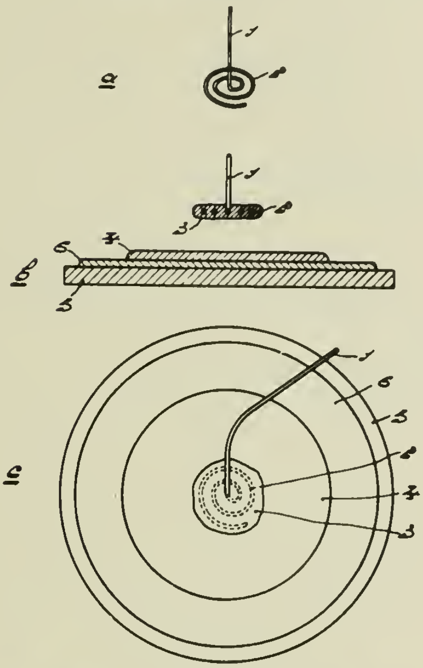
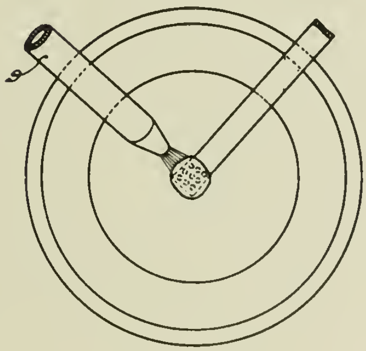


Fig. 2



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METHOD OF CONNECTING AN ELECTRIC CONNECTING LINE, BY MEANS OF A CONDUCTIVE ADHESIVE, TO AN ELECTRODE OF A BLOCKING-LAYER RECTIFIER WHICH CONSISTS OF LOW-MELTING MATERIAL

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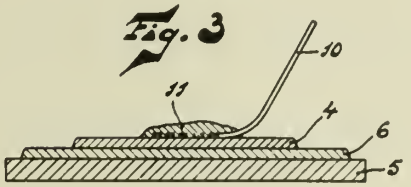
2 Sheets-Sheet 2

Fig. 3



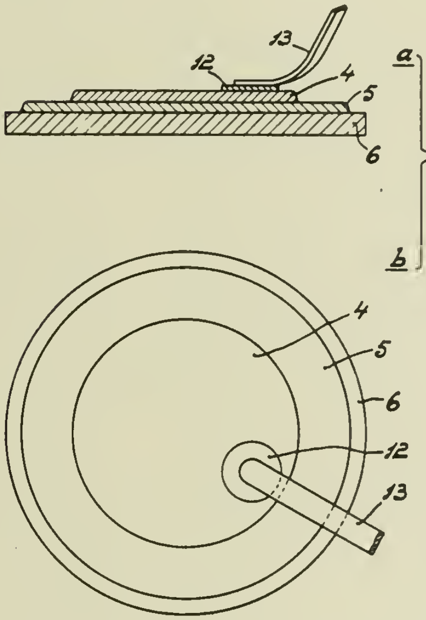


Fig. 4

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ALIEN PROPERTY CUSTODIAN

BLOCKING-LAYER RECTIFIER COMPRISING A COOLING PLATE

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Application filed May 29, 1941

This invention relates to a blocking-layer rectifier comprising a cooling plate. Various constructions have already been proposed to render the cooling as effective as possible, but carrying off the heat evolved in a rectifying cell to the cooling plate in an efficacious manner has always been a difficult problem. The following facts have to be taken into account. The conductivity of the contact parts between cell and cooling plate should be as high as possible. The construction must be as simple and light as possible, since otherwise the assembly would become too heavy, too expensive and too bulky.

The problem of interconnection of the cells is also in relationship therewith. Hitherto a construction has rather commonly been used, in which the cells (and also the cooling plates) had a central bore which apertures received a bolt. In this way the cells were consequently placed in a row. Particularly in regard to cells having a small size this construction has the drawback that due to the bore a considerable part of the surface of the cell-plate is lost for rectification.

The present invention has for its purpose to procure means for avoiding the above-mentioned drawbacks.

According to the invention the cooling plate is provided with cavity accommodating the disc-shaped rectifying cell and it is equipped with fastening means for the assemblage of a number of rectifying cells.

The assembly according to the invention yields a rectifier in which an excellent thermal contact between the cell and the cooling plate is established without the need for other mechanical means. Hence the cells may have an unprecedented small size for a given load capacity. Since there is no central bore for a fastening bolt, the surface of the cell is completely utilised. In fact, interconnection of the cells is effected by means of the cooling plates, and since each of the latter is mechanically fixed in a rigid manner to a cell the fixation of the cells is assured at the same time.

The construction according to the invention is very advantageous particularly for cells having a small surface such as used at small loads, since interconnection of the cells is not effected on the cell itself but through the intermediary of the corresponding cooling plate. Consequently the difficulty of providing the small cells with fastening means is disposed of. Preferably, the rectifying cell is so secured in the cavity of the cooling plate as to be clamped therein.

In a suitable form of construction of the invention the bottom of the cavity in the cooling plate exhibits an annular groove. In this way it is achieved that the wall accommodating the rectifying disc is resilient which yields an excellent clamping. The groove also permits the rectifying disc to be pressed on to the bottom of the cavity. Generally the cavity will be formed by pressing. In this case, however, it is impossible to obtain a sharp corner. Upon introduction of the disc it would consequently bear on the rounded corner instead of bearing on the bottom itself and there would be a risk of disconnection. The cavity preferably has a conical side wall. Upon introduction of the rectifying disc into a cavity this wall is widened which is enabled, inter alia, by the annular groove provided in the bottom of the cavity.

The method of securing the rectifying disc to the cooling plate may serve not only for the transmission of heat but also for conveying electric current. In this way special means for establishing electric contact between one of the electrodes of the cell and an external circuit are disposed of.

The invention will be more fully explained by reference to the accompanying drawing.

Fig. 1 represents the cooling plate of a rectifying cell, *1a* being a section, and *1b* being an elevation of the plate.

Fig. 2 shows the cell secured in the cooling plate and

Fig. 3 shows the construction of a plurality of rectifying cells assembled with their cooling plates to form a unit. The section is taken on the line III—III in Fig. 1*b*.

From Fig. 1*a* it appears that the square cooling plate **1** has a central cavity **2**. The first part of the walls **3** of this cavity is slightly conical and there is provided an annular groove **4**. The diameter of the cavity in the plane of the plate itself, i. e. at **5**, corresponds to the diameter of the rectifying disc shown in Fig. 2. Owing to the conical shape of the cavity and the provision of groove **4** the rectifying disc engages the cavity under spring control thus obtaining a perfect thermal contact over the whole periphery of the rectifying disc. It may still be observed in this respect that the conicity of the cavity may not be exaggerated, since otherwise the rectifying disc would disengage from the cavity. The bottom of the cavity **2** is furnished with a central aperture **6** which serves to counteract cracking upon pressing the cavity and to confer more resiliency on the assembly. If the disc is secured by soldering to the cooling plate the apertures **6** may at the

same time be used for providing the solder between the disc and the plate.

Furthermore Fig. 1*a* shows two apertures with raised edges 7 and 7′ obtained by punching in such manner as to form an upstanding rim. The location of these apertures appears more particularly from Fig. 1*b* in which corresponding parts bear the same reference numerals. The purpose of the rims will be more fully explained later by reference to Fig. 3. At one corner of the plate are provided incisions 8 facilitating the attachment of a junction wire for the soldering operation. In fact, the wire is first clamped to the plate by means of these incisions.

Fig. 2 represents the disc-shaped rectifier. The substratum 10 of aluminium carries the selenium electrode 9. This selenium electrode carries, with the interposition of the blocking layer 11, the counter-electrode 12 which consist of an alloy of tin, bismuth and cadmium and melts at about 100° C. It will be appreciated that the ratio of the thickness of the electrodes, blocking-layer and substratum are not represented to scale.

The supply conductor for the counter-electrode 12 consists of a wire 13 which is wound to form a spiral 14 at its end, which is dipped in the same alloy material which is also used for the counter-electrode.

Since the cooling plate electrically contacts directly with the substratum 10, and consequently with the electrode 9 the electrode 12 should be prevented from contacting also with the cooling plate. As shown in the drawing the difficulty is solved by giving the top of the disc a conical shape (for instance by grinding or turning). As an alternative, however, the alloy may be applied to the blocking layer by means of a templet in such manner that the outer edge is left clear.

As shown in Figures 1 and 2 the cooling plate together with the rectifying disc fastened therein may now be incorporated in a rectifying unit, the assembly being accommodated to the voltage to be applied and to the currrent to be passed, whilst taking into account the load-capacity per cell. The construction of such a unit appears from Fig. 3, in which 15, 15′ and so on designate the rectifying discs, and 16, 16′ and so on denote the cooling plates. The cooling plates are interconnected through the intermediary of rods 17 of insulating material such as porcelain, which are slipped through the apertures 7 having raised edges (see also Fig. 1*a*). The rods 17 have a diameter corresponding to that of the apertures 7 so that the cooling plates are clamped on the rods. The purpose of the raised edges is obvious, since they avoid deformation of the unit.

Of the unit shown in Fig. 3 there are represented only three cooling plates with clamped rectifying discs. The diameter of the rectifying discs amounts to 14 mms. The dimensions of the cooling plates are 26 x 30 mm^2. The rectifying discs are all connected in series. To this end a wire 13 is at any instance soldered to the adjacent cooling plate 16 in the way indicated by the numeral 8 in Fig. 1 and described in the part of the description corresponding to this figure.

The blocking layer cells may have a maximum blocking voltage (counter voltage) of say 35 volts. For a definite use 13 cells, for instance, are connected in series. In this case the maximum direct output current prescribed has a value of 66 mt. The number of cells depends on the use of the rectifying unit and in accordance therewith they may be connected in series, in parallel or in series-parallel.

The iron cooling plates may be bare or galvanised (for instance copper-plated) not only for promoting the transmission of heat to the surrounding air but also to facilitate the soldering operation of the supply conductors.

In order further to promote the transmission of heat it is advisable that the surfaces of the plates should be coated with a black lacquer, which may be effected, for instance, by dipping them in a lacquer containing graphite. After the layer has been dried the rectifying unit is protected, moreover, against the chemical action of materials contained in the atmosphere, which is of particular importance when such a unit is used for galvanising purposes. In order to prevent the layer of lacquer from establishing undesirable electrical connections between the various parts of the rectifying unit it may be desirable first to coat the rectifier with a non-conductive kind of lacquer, after which the assembly is dipped in the lacquer containing graphite.

It has been found that owing to the presence of a layer of lacquer the rectifier is not only protected against chemical action from without, but in addition that the mechanical strength of the various connections, for instance, soldered joints, has been materially increased.

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C. DE LANGE ET AL
BLOCKING-LAYER RECTIFIER COMPRISING
A COOLING PLATE
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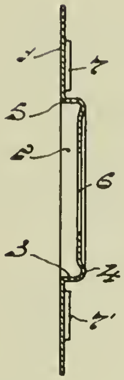
Fig. 1a



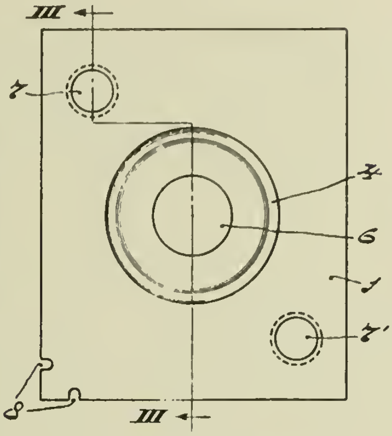


Fig. 1b

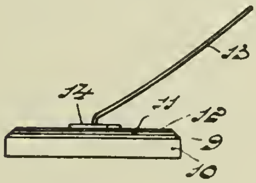


Fig. 2

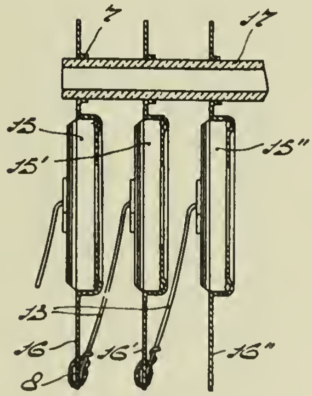


Fig. 3

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ALIEN PROPERTY CUSTODIAN

METHOD OF RECORDING AND REPRODUCING STEREOPHONIC SOUND VIBRATIONS

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Application filed May 29, 1941

This invention relates to a method of recording stereophonic sound oscillations. When recording use is made of several spatially separated microphones. The acoustic sound oscillations converted into electric oscillations are fed by separate channels to several loudspeakers arranged at adequate relatives spacings. Thus, a reproduction is obtained which creates the illusion of sound perspective. If the electric oscillations are transmitted from microphones to loudspeakers a sound record on a carrier may be interconnected. However, in such arrangements difficulty is encountered in maintaining perfect synchronism between the stereophonically associated sound records during reproduction. The least relative displacement of the sound tracks results in disturbance of the illusion of sound perspective.

In order to maintain synchronism it has been suggested before that the sound oscillations received from the various channels should be recorded in a single sound track so that synchronism cannot be lost. One of the known methods consists in modulating several carrier waves by the sound of the various channels and in recording the carrier waves thus modulated jointly in one track. On the reproducing side these carrier waves have to be separated by filters, the various sound frequencies being then again rendered audible by demodulation.

A further well known method consists in the use of two channels one of which is recorded in an unchanged manner, whereas the other is caused to modulate a carrier wave lying beyond the frequency range of the first channel. The modulated carrier wave is then recorded in the same sound track but since its frequency range lies beyond that of the first channel it can be reproduced separately with the aid of a filter.

All of the above-mentioned known methods, however, have the disadvantage that the system on the reproducing side is rather involved. It is necessary to provide filters having to transmit a given sharply defined frequency band and entirely to cut off the frequency lying outside. Such filters are highly involved whilst their operation is not final so that by-sounds are always audible during reproduction.

The invention has for its object to make a stereophonic sound record in two channels in a single sound track, it being possible for this sound record to be reproduced by a comparatively simple equipment.

According to the invention, the sound oscillations of both channels are caused to modulate a carrier wave of at least 7000 cycles/sec. in such manner that the oscillations of one of the channels modulate solely the positive amplitude peaks and those of the other channel modulate solely the negative amplitude peaks of the carrier wave. The carrier wave thus modulated is recorded on a carrier in a single sound track by a single recording device.

In any event the above-mentioned method affords perfect synchronism between the two channels since irrespective of changes in form to which the film material is subjected the two sides of the sound track are always located opposite to each other.

According to the invention, the sound record thus made is reproduced by scanning of the sound track by means of a single photo-electric cell, splitting-up of the positive and negative halves of the carrier wave by means of a device known per se, demodulating each half, filtering-out of the carrier wave and reproducing each of the two channels thus obtained by separated reproducing devices.

Although on the reproducing side filters are required for filtering-out the carrier wave, these filters need only to filter out a single given frequency. Such filters are of very simple construction and their operation may be fairly complete.

The highest sound frequency that can be transmitted by the method according to the invention is equal to half the carrier-wave frequency used and hence at least 3500 cycles/sec. The invention is also based on recognition of the fact that such vivification of the sound reproduced occurs that the above-mentioned limitation of the frequency band to be reproduced has no disturbing effect.

In one embodiment of the invention a further improvement in sound transmission is enabled by the use of a recording method known per se according to which the sound track exhibits width and depth variations cut through an opaque covering layer of a carrier by means of a V-shaped cutter having an apical angle of about 174°. This recording method even permits of faithfully recording frequencies above 7000 cycles/sec. It is thus possible to obtain a record up to 9000 cycles/sec. and this permits of the range of the sound frequencies to be recorded being increased to 4500 cycles/sec.

In order that the invention may be clearly understood and readily carried into effect it will now be described more fully with reference to the accompanying drawing, in which

Fig. 1 shows a circuit arrangement for sound recording,

Fig. 2 shows a carrier wave modulated by means of the circuit shown in Fig. 1,

Fig. 3 shows a reproducing device for the sound record thus obtained.

Referring to Fig. 1, 1 and 2 designate two recording microphones which jointly with the associated microphone amplifiers 3 and 4 constitute two channels 25 and 26 by which the sound oscillations are transmitted while conserving the stereophonic effect. Before the recording device are connected two electric discharge tubes 29 and 30 which are coupled to both recording channels by means of a suitable transformer 27. This transformer 27 has fed to it a carrier wave by means of an oscillator device 28 which generates a frequency of 7000 cycles/sec. or higher. The value of the amplitude of this carrier wave and the characteristics of the tubes 29 and 30 are such that these tubes operate in the curved parts of their anode-grid characteristic curve so that the sound oscillations supplied by the channels 25 and 26 are caused to modulate this carrier wave. This modulation occurs in such a manner that the amplitude peaks of a given direction, for example the positive direction, are modulated by the sound frequencies from the channel 25 and the amplitude peaks of the opposite direction, for example the negative direction, by the sound oscillations of the channel 26. The carrier wave is thus given a nature as shown in Fig. 2, that is to say the side bands are different.

The carrier wave thus obtained is fed, with the interposition of a transformer 40 and a recording amplifier 7, to a recording device 8 which records a sound track on a carrier. This recording device may be of any known construction, that is to say photographic equally well as mechanical, so long as at least a frequency of 7000 cycles/sec. can be recorded thereby.

Fig. 3 shows a device by means of which a sound record recorded in the manner shown in Fig. 1 can be reproduced. The sound track is scanned by means of a single photo-electric cell 11. The electric oscillations thereby generated are amplified in a photo-electric cell amplifier 32 and are fed to two oppositely connected valves 41 and 42. A separation of the carrier wave into two opposite parts is brought about by these valves, one of which solely transmits the positive amplitudes, whereas the other valve solely transmits the negative amplitudes. In these valves, which are constructed as rectifiers, also demodulation occurs by rectification. Each of the halves of the carrier wave which is modulated by the sound oscillations received from one of the two channels is amplified in the intermediary amplifier 43, 44. The sound frequency still present which is received from a carrier wave is filtered out by filters 36, 37, the sound being then fed by one of the final amplifiers 15 and 20 to two spatially separated reproducing devices 16 and 21.

The above-described reproducing device can be readily arranged in an existing system in replacement of a non-stereophonic reproducing device. For this purpose it is necessary to provide two separated reproducing devices. Generally, two amplifiers are already provided so that the interconnection of the valves 41 and 42 and of the filters 36 and 37 suffices. If desired, this aggregate may be assembled in an appliance, thus permitting of the system being rebuilt for stereophonic reproduction by the addition of the said appliance and a second loudspeaker.

Since, as is well-known, the stereophonic effect is practically imperceptible in the reproduction of sound oscillations below 300 cycles/sec. it is sufficient to feed these low tones in only one of the two reproducing channels to the loudspeaker for the reproduction of the low-frequencies. This may be effected by supplying a third loudspeaker, which is arranged between the loudspeakers 16 and 21 with the interposition of a filter that cuts off the frequencies above 300 cycles/sec. The supply conductor to the loudspeakers 16 and 21 includes filters which suppress the oscillations below 300 cycles/sec.

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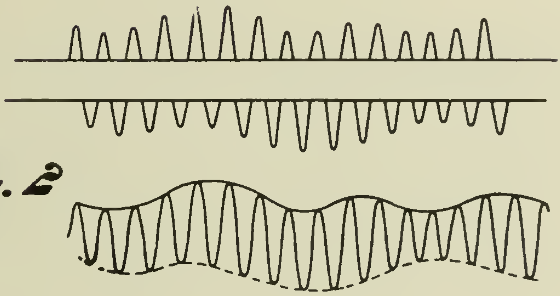

Fig. 2

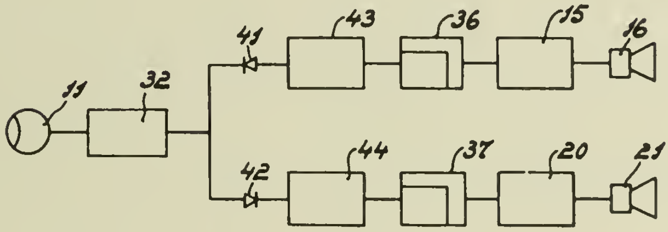

Fig. 3

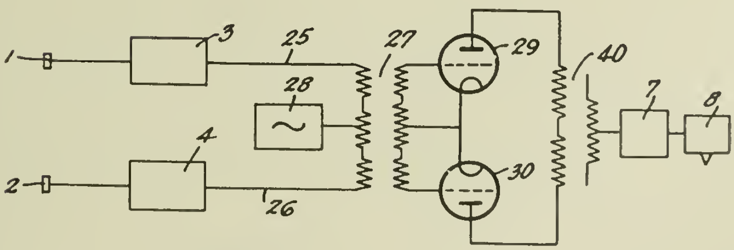

Fig. 1

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ALIEN PROPERTY CUSTODIAN

PORTABLE STEREOSCOPIC DEVICE FOR CHECKING ELECTRIC METERS

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Application filed May 29, 1941

In Patent 2,123,115, the author of the present invention has described a stroboscopic device adapted for the adjustment of subscribers' electric meters at the subscribers' premises. This apparatus consists in a case which is fixed, for the adjusting operation, under the meter to be checked. The case contains a standard meter which, with a source of light and an optical system, produces the stroboscopic illumination of the subscriber's meter, together with electrical circuits necessary for the comparison of the two meters; these circuits lead to contact plugs or studs carried by the case, which are brought into contact, upon performing the adjusting operation, with other contact pieces arranged on a panel permanently fixed below the meters to be checked and to which the case is fixed temporarily for performing the operation.

In the embodiments described in this patent, the comparison circuits contained in the case were established for permitting a precise adjustment of the meters under all loads as well as under various power factors. This led to a comparatively heavy and too cumbersome an apparatus for the mere use as a checking apparatus.

The present invention concerns an alternative embodiment of this portable stroboscopic device, designed with the view of permitting a monthly check of the correct adjustment of the standardised subscribers' meters on low voltage mains (for instance 110 volts mains) by the staff employed for taking periodically the meters' readings. For this purpose, it is necessary to provide a portable apparatus which is much lighter and less cumbersome than that provided in the cited patent, and which will further considerably reduce the time required for effecting a check, while demanding from the operator no special technical instruction.

The device according to the present invention is characterised by the fact that the electric checking parts, consisting on one hand in a small number of resistances which may be inserted into the circuit of the current coils of the two meters and which correspond to the usual loads of the meter to be checked, and, on the other hand, in means for obtaining rapidly, during the comparing operation, the speeds of the standard meter, corresponding to the upper and lower permissible limits (for instance +3% and −3%) of the misadjustment.

According to another characteristic of the invention, which is a consequence of the first, the panel carrying the contacts which are fixed permanently below the meters to be checked and are connected to the checking parts of the stroboscopic apparatus, is constituted by the subscriber's main two-pole switch.

By way of example one has described below and represented schematically on the annexed drawing one embodiment of the device according to the present addition.

Figure 1 is a perspective view of the apparatus in the operating position,

Figure 2 shows the stroboscopic apparatus in vertical section,

Figures 3 and 4 represent the wiring connections of the checking apparatus and the meter to be verified,

Figures 5 and 6 are, in plan view and transverse section respectively, a subscriber's two-pole switch adapted for receiving the stroboscopic apparatus,

Figure 7 is a diagram for the supply of the lamp contained in the apparatus, and

Figures 8 and 9 show schematically two different optical devices giving the required beam of light.

Similarly to the device according to the preceding invention, the device object of the present invention comprises a portable case 1 provided with handles 2, 2' and containing a standard meter 3, a source of light 4 projecting a beam of light through a fixed comb 5, preferably constituted by a film carrying a picture of a system of teeth, and a second similar film 6, fixed to the edge of the disc 7 of the standard meter, on the lower face, carrying the marking lines, of the disc of the meter to be checked 8, through a window 9 provided with an index 10 and located in the label-plate 11 of the meter. The case 1 is fixed, for effecting the check, below the meter 8 to be checked, by means of contact plugs or studs 13, 14, 15, 16 (Figures 2 to 4) fixed to the case 1, to which are connected the standard meter and the various checking parts and which come into contact with corresponding parts arranged on a panel fixed permanently below the meter 8. The displacement of the marking lines of the disc of meter 8 is observed by reflection in the magnifying mirror 12 provided on the case 1, or by means of any other suitable optical device such as a rectangular prism fitted with convex lenses.

As shown in the wiring diagram of Figure 3, the case 1 comprises, apart from the optical system, the current and voltage windings 17 and 18 of the standard meter, a high resistance 35 and a number of, for instance three other resistances 19, 19', 19'' which may each be connected sepa-

rately, or two or three in parallel, to the terminals of the standard meter by means of switches 20, 20′, 20″ actuated from the outside by push-knobs 21, 21′, 21″ (Figure 1) provided on the case 1. These resistances are heat-insulated or ventilated in order not to harm, by radiation of heat into the case 1, the precision of the standard meter. To this effect, the resistances are arranged in a flat apertured box 22 (Figure 1) fixed to one side of the case 1 without contact with the latter, in order to leave an interval which will protect the case against any undue heating. Besides, the switches 20, 20′, 20″ may be provided with an automatic opening device in case of excessive heating, comprising for instance bimetal strips. These resistances are chosen in a manner to correspond, according as to whether there is only one or a certain number of them connected in parallel, to certain usual loads of the subscriber's meter, as for instance a low load, a medium load and full load.

The windings of the standard meter are connected, as indicated above, to four plugs or studs 13, 14, 15, 16 provided on the case 1 and corresponding to a set of similar contact pieces 13′, 14′, 15′, 16′ substituting the four studs of the subscriber's main two-pole switch 23 (Figure 4) which connects the meter 8 in the usual manner to the subscriber's inside installation 24 comprising for instance lamps 25, 25′, . . . or other utilities. It will be seen that when the contacts 13—13′, 14—14′, 15—15′, 16—16′ are established by the application of case 1, with the switch 23 in the operating position, the voltage windings 18, 18′ of both meters are connected in parallel on the mains 26 by 27, 29, 18′, 30 and 28, and by 27, 29 17′, 14′—14, 33, 18, 15—15′, 13, 31, 30 and 28, while the current windings 17—17′ are connected in series with one, two or three of the resistances 19, 19′, 19″ (in parallel) (circuit 27, 29, 17′, 14′—14, 17, 16, 20″, 19″ for instance 15—15′, 13′, 31, 30, 28), this resistance 19″ for instance is connected in parallel to the subscriber's circuit, so that the checking may be effected without disturbing the latter. It will be seen that it is owing to the arrangement adopted for the electric checking connections that it is possible to connect the apparatus to the subscriber's main two-pole switch.

To this end, the subscriber's main two-pole switch (Figures 5 and 6), which comprises, as usual, a base plate 50, an insulating lid 51, four jaws 52, 52′ and 53, 53′ and two blades 54, 54′ and 55, 55′ mounted on an axis 56 actuated by a handle 57, is further provided with four pins 58, 58′, 59, 59′ fixed on the insulating lid 51 and serving the purpose of fixing the case 1 to the switch, and, on the other hand, four posts 60, 60′, 61, 61′ fixed to the base plate 50 and connected respectively, by means of conductors 62, 62′, 63, 63′, to the switch jaws 52, 52′, 53, 53′. The upper ends of these posts, which protrude from the insulating lid 51 through apertures provided to this effect in the latter, carry enlarged heads 64, 64′, 65, 65′ serving as contact pieces and against which will come to lie the four contact pieces of case 1 for instance in the form of brass springs, blades or brushes. In case the contact pieces of the stroboscope case are constituted by plugs, the posts 60, 60′, 61, 61′ carry corresponding apertures 66, 66′ (Figure 6) in a manner to form sockets for the said plugs. The tops of posts 60, 60′, 61, 61′ may of course also not protrude over the lid 51 and the contact pieces of the case penetrate into the latter.

In the embodiment provided by the present invention, the checking of the misadjustment of the meter under check (with its sign + or —) is effected by varying the speed of the standard meter from one to the other limit of the permissible misadjustment, by means of a switch 33 supplying its voltage coil through one or the other of two tappings, one of them corresponding to the lower limit of the misadjustment, and the other to the upper limit. The meter of the device being, for instance, adjusted to the predetermined upper limit of inaccuracy (3% fast) while the lower limit (3% slow) is given by the other position of switch 33, the operator will proceed as follows: holding the case 1 in one hand, he will take off the lid of the subscriber's two-pole switch 23, fix the checking apparatus to the latter by holding it for instance with his two hands by the handles 2, 2′, then insert it in the subscriber's load circuit by opening said switch if it is not already opened. At this moment, the lamp of the optical system will light up and the standard meter will rotate while the operator has his hands free again. The operator will merely have to observe in the magnifying glass 12 the image of the marks carried by the disc of the subscriber's meter under check, and then, by actuating in succession the corresponding push-knobs, insert in the circuit any one or combination of the said resistances to give the usual loads, and check, by actuating the switch 33, if the speed of the subscriber's meter is comprised between the two limiting values of the standard meter.

The arrangement of the stroboscopic apparatus and the rapid method of verification employed permit the use of resistances of the type generally employed in electric irons, for the resistances 19, 19′, 19″ serving as test loadings for the meters. Thus each resistance will consist for instance in a resistant strip, about 5 feet long, wound on a mica sheet inserted between two other insulating mica sheets somewhat larger than the first, the latter sheets being held between two aluminium plates riveted to one another and giving the assembly the required mechanical protection. Resistances of this type are here very advantageous by reason of their very low weight; they have up to the present generally been used for giving a rapid and strong heating, which might here seem to prove harmful. Their use for the present purpose is possible here only because of the fact that the time required for performing a stroboscopic measurement, i. e. the time during which the resistances are actually in circuit, is very short, say about 10 seconds. The amount of heat to be dissipated is consequently very small and it will therefore suffice, in practice, to arrange these test resistances 19, 19′, 19″, as shown in Figure 1, in an apertured casing 22 fixed to the stroboscope case 1, casing and case being separated from one another by a small interval of air of about ¼ inch.

Apart from the stroboscopic checks indicated above, it will also be required to check the meter for correct starting under very low load conditions.

To this effect, the switch 34 (Figure 3) permits, when the subscriber's main switch is opened, to leave in the current circuit of the meter under check, the resistance 35 corresponding for instance to a load of the order of $\frac{1}{50}$ the rated load.

With the main switch 23 open and contact 34 of the case also open, the circuit will then be the following: 26, 27, 29, 17′, 32, 14′, 14, 17, 16, 35,

13, 13′, 31, 30, 28, 26. The check of correct starting is effected through the means of the optical system.

The lamp of the stroboscope device could be supplied by a battery arranged in the case, but, with the same view of decreasing the weight of the apparatus, which is an essential condition for making it practical in use, it is preferable to supply the lamp directly from the A. C. mains. The fact that the stroboscopic device is placed immediately below the meter under check, at a small distance from the latter, and that the disc of the latter, especially its lower face, which receives the stroboscopic interrupted luminous flux, is placed in nearly complete darkness, permits the use of a very weak source of light, for instance the bulb of a pocket lamp, consuming 0.5 amp. under 3.5 volts. Such a lamp will produce practically no heating in the case and thus will not disturb in any way the precision of the standard meter. There are various arrangements for supplying such a lamp from the mains, as especially a transformer, but the comparatively large weight of the latter would make the case unnecessarily heavy, a condition which it is absolutely necessary to avoid in this case. A resistance could also serve the purpose, but it would heat the case, and such heating is to be avoided, and further consume a comparatively large current.

According to one characteristic of the present invention, one will preferably use, for supplying this lamp 4 (Figure 7), a condenser 36 connected in series with the lamp, which will thus operate on the charging and discharging current of the condenser. An adjustable resistance 37, in parallel with the lamp, permits the adjustment of the lamp voltage.

Owing to the low value of the illumination, it is necessary to take special precautions in order to obtain a sufficiently sharp stroboscopic effect, i. e. sufficiently sharp cuts of the luminous flux, especially if the disc of the standard meter producing these cuts rotates very slowly under weak loads. Thus, for instance, an 8 to 10 cm diameter disc may carry, around its periphery, 1000 lines, i. e. about 30 lines per cm periphery. According to the cited patent, the luminous flux passes in succession through a fixed comb and the teeth of the rotating disc of the standard meter. Such a device, however, cannot give complete occulations, even if the comb and disc are very close to one another, because, owing to the dimensions, which are not negligible here, of the source of light, there will always pass a certain amount of diffuse light, which will be sufficient for decreasing to a large extent the stroboscopic effect. For remedying this drawback, the comb teeth and the marks on the disc of the standard meter are made, according to the present invention, as the author has already indicated previously, by means of a circular film carrying, at the required scale, a photographic copy, so fine and sharp as it is desired, of teeth or simply of a scale, at first drawn at a larger scale, and the image of the fixed comb is then projected upon the film forming the teeth on the disc of the standard meter. In this way, the fixed teeth (image) and the moving teeth (object) lie in the same plane and the interruptions of the beam are consequently perfect. This device is shown schematically in figure 6, which is an elevational view of this part of the apparatus.

The film carrying the photographed teeth 40 and constituting the fixed comb is illuminated from below by the lamp 41 by means of the collimator 42. Its image is formed by a lens 43 upon the photographed teeth carrying film 44 forming the edge of the disc of the standard meter, this image having exactly the same dimensions as the film teeth 44. Thus, when the movable teeth or scale 44 comes to lie in a position in which its slots are opposite the teeth of the image, the luminous flux will be completely interrupted and the stroboscopic effect excellent.

In certain cases, it may be sufficient to use a simplified projection device. The image of the photographed teeth carrying film forming the edge of the disc of the standard meter is then projected at an enlarged scale by the optical system under the disc of the meter under check. This film 45 (figure 7) is illuminated from below by a lamp 46 eventually provided with a collimator 47. An optical system 48 projects the image of this film 45 under the disc 49 of the meter under check. There will thus be formed, beneath the lower face of the disc of the meter under check, a region illuminated intermittently with a frequency equal to the travel frequency of the lines or teeth of the disc of the standard meter in the luminous beam.

GUSTAVE ERNEST MAILLAT.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

G. E. MAILLAT
PORTABLE STEREOSCOPIC DEVICE FOR CHECKING
ELECTRIC METERS
Filed May 29, 1941

Serial No.
395,893
3 Sheets-Sheet 1

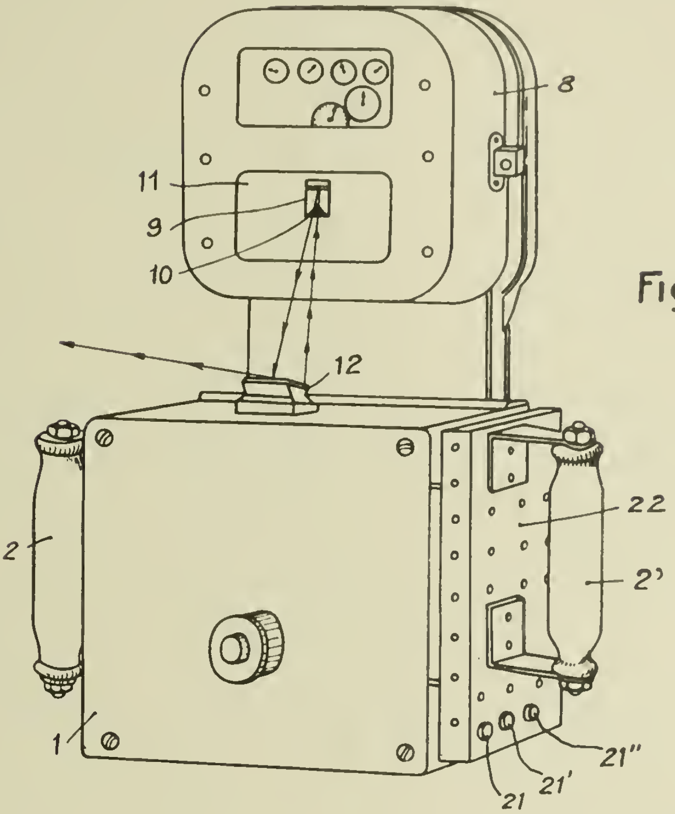


Fig. 1

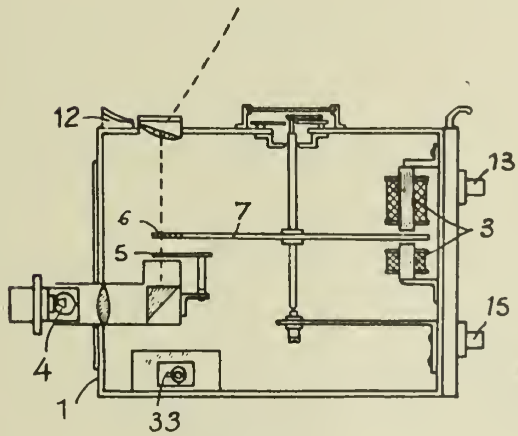
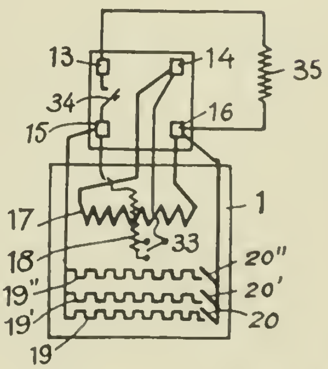


Fig. 2

Fig. 3



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3 Sheets-Sheet 2

Fig. 4

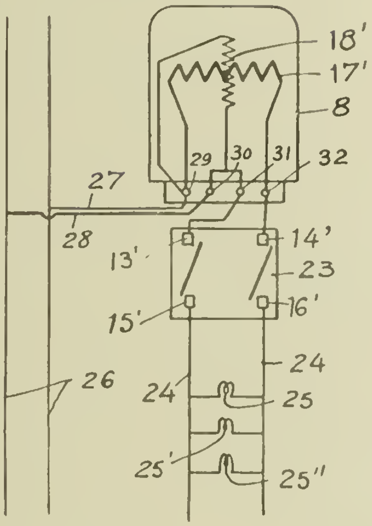


Fig. 7

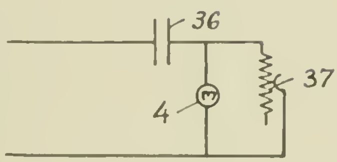


Fig. 8

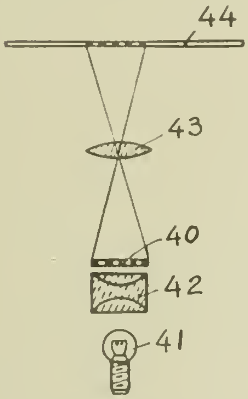
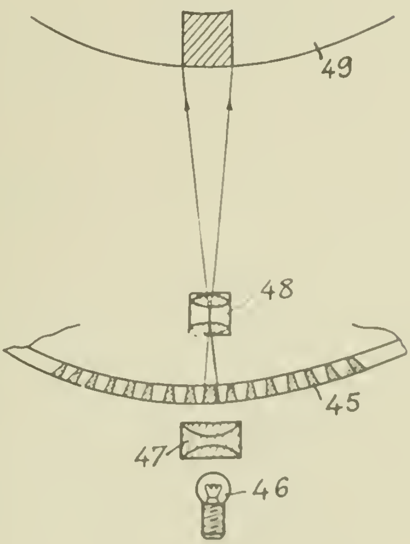


Fig. 9



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Serial No. 395,893
3 Sheets-Sheet 3

Fig. 5

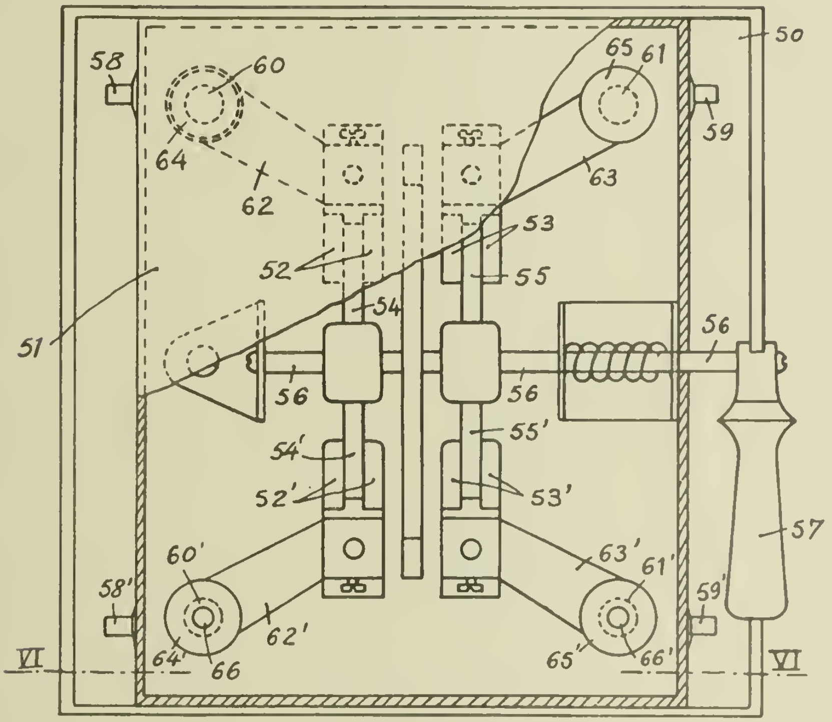
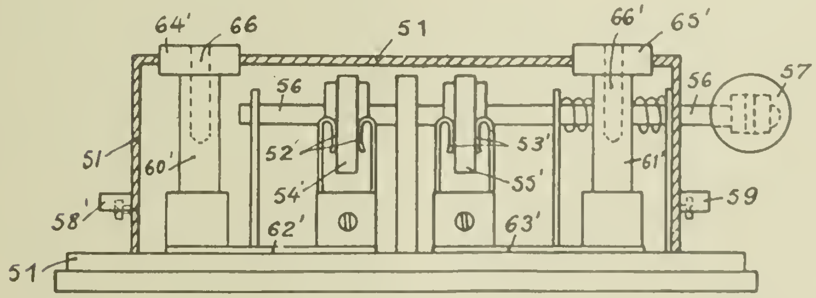


Fig. 6



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ALIEN PROPERTY CUSTODIAN

AMPLIFIER CIRCUIT FOR ULTRA-SHORT WAVES

Werner Kleen, Berlin, Germany; vested in the Alien Property Custodian

Application filed June 3, 1941

In all amplifier circuits the reaction by the plate alternating potential by virtue of the grid-plate capacitance upon the control grid is extremely annoying, for it means that the input and the output circuits are no longer independent of each other; indeed, they are coupled by an impedance the size of which is determined by the grid-plate capacitance. The plate reaction is particularly strong in the case of ultra-short waves, that is, waves of a length less than 5 meters, for the reason that in this wave band the alternating-current resistance of the grid-plate capacitance is extremely low and thus the coupling between input and output circuits very strong. Now, the invention hereinafter to be described is suited to completely eliminate the plate reaction.

The plate reaction must be obviated entirely if the occurrence of an alternating potential at the plate is wholly avoided, and this is feasible if the plate circuit is designed in the form of a series resonant circuit tuned to the operating frequency and which consists of an inductance and a capacity. The amplified potential may be derived from across one of the two elements of the series resonant circuit and fed to the input circuit of the next stage. Preferably the series resonant circuit is associated with the tube in such a way that the inductance is united with the plate and the capacity with the cathode, the amplified potential being derived from across the capacity. This arrangement is expedient for the reason that the input capacitance of the following tube is connected in parallel to the capacity of the series-resonant circuit or may act as such.

The invention will now be described in connection with the accompanying drawing in which Figs. 1, 2 and 3 disclose circuits embodying various modifications according to the invention.

Referring to Fig. 1, there is shown the tube 1 upon the control grid of which, that is, across the terminals *a* and *b*, there is impressed the alternating potential U_g to be amplified, while by way of a high resistance grid leak R_g a grid biasing voltage is impressed. Between plate and cathode is the series resonant circuit comprising the inductance L_1 and the capacity C and tuned to the input alternating potential U_g. The D. C. plate voltage is supplied through a choke coil D. Inasmuch as the series resonant circuit constitutes a short-circuit for the operating frequency, no alternating potential at all will arise at the plate of tube 1, and this means that reaction by the plate alternating voltage through the grid-plate capacitance C_{ga} upon the control grid is entirely precluded. The amplified alternating potential is taken off at the capacity C and then through a coupling condenser C_k which represents a negligibly low resistance for the operating frequency is impressed upon the control grid of the following tube 2. Also the control grid of the latter tube, through a high-ohm leak resistance R_g is impressed with a negative biasing voltage for the purpose of fixing the operating point.

In the amplification of ultra-short waves, that is, wave-lengths less than 5 meters, the foregoing circuit organization fails to furnish sufficient amplification, as can be demonstrated by the following considerations: Capacitor C is connected in parallel relation to the input capacity of tube 2. The capacity acting in the series resonant circuit is at least equal to the input capacity of tube 2, and this capacity as a general rule can not be made less than 3 mmf. It is known in the art that the alternating-current resistance Z of a capacity, for a wave-length λ, is calculable by this formula:

$$Z=\frac{530.\lambda}{C}$$

where λ is in terms of meters, and C in mmf. while Z is in ohm values. For $\lambda=1$ meter and $C=3$ mmf. there follows that $Z=180$ ohms. For the alternating potential U_c which arises at the capacity C there holds good the relation

$$U_c=S_m.Z.U_g$$

Inasmuch as the slope S_m (mutual conductance), in the conventional kind of short-wave tube, may be taken to be around 2mA/V, there results for the case cited $U_c=.36U_g$. In other words, tube 1 fails to give gain; in fact, the input alternating potential U_g is reduced. However, this drawback may be obviated by the step as hereinafter outlined.

In an amplifier circuit organization for ultra-short waves in which the output circuit is a series resonant circuit and in which the output potential for the following stage is taken from across the capacity of the series resonant circuit, the capacitive element or component of the series resonant circuit according to the invention, consists of the input capacity of the next tube and a capacity optionally connected in parallel relation thereto on the one hand, and an inductance connected in parallel relation thereto on the other hand, the inductance being chosen of such dimension that together with the capacity in parallel thereto it represents a capacitive impedance (reactance) which is essentially smaller than the input capacity. This shall now be explained by

reference to the circuit shown in Fig. 2. The arrangement comprises the same elements as shown in the circuit of Fig. 1, but in addition an inductance L_2 which is arranged in parallel relation to the capacity of the series resonant circuit. The fly-wheel circuit consisting of the inductance L_2, the input capacity C_e and optionally an additional capacity C' is so detuned in reference to the frequency to be amplified, in other words, is tuned to a so much lower frequency, that the fly-wheel circuit, for the operating frequency, acts like a capacity which is far lower than the input capacity C_e. Proper tuning may be effected, for instance, by variation of the capacity C', unless it is preferred to dispense with the capacity C' and to use for the capacitive component of the series resonant circuit only the input capacity C_e. In this latter instance, the tuning of the fly-wheel circuit C_eL_2 is brought about either by suitable choice of the inductance L_2 or else by variation of the input capacity C_e. The latter scheme is feasible for the reason that the input capacity is a function of the discharge density between the cathode and the control grid so that it is open to action in a circuitous way through the discharge current of tube 2. Hence, if the fly-wheel circuit operative between the control grid and the cathode of tube 2 is tuned in such a way that it represents for the operating frequency a capacity of, say, 0.3 mmf., in the light of the data and relations before-mentioned, for a wave-length of 1 meter, this corresponds to an impedance of 1800 ohms. Assuming a slope of 2 ma/V, an input potential results at the grid of tube 2 which is 3.6 times higher than the alternating potential U_g fed to the grid of tube 1; in other words, the voltage gain is 3.6.

Fig. 3 shows another embodiment of the circuit organization of this invention in which the input capacity C_e serves as the capacity of the series resonant circuit, of which by means of the inductance L_2 part is "tuned away". In the form of construction here shown the blocking condenser C_k is inserted in the lead brought to the control grid of the tube 2 in such a way that the additional inductance L_2 is included in the D. C. plate circuit of tube 1. However, the blocking condenser could also be connected between L_1 and L_2 so that the additional inductance L_2, in respect to D. C. pertains to the grid circuit of tube 2.

In designing the circuit organization of the invention it is recommendable to use tubes fitted with a screen grid between control grid and plate, or, optionally, fitted with an additional suppressor grid between the screen grid and the plate. If the series resonance circuit hereinbefore described which is used to act as an external resistance had no damping, no alternating potentials would arise between plate and cathode of the tube; hence, no reaction would arise regardless of what the value of the grid-plate capacitance might be. However, inasmuch as damping in the series resonant circuit is inevitable, especially where short waves are dealt with, a small alternating potential will always be present. For this reason it will be expedient, in order to minimize the reaction by way of C_{ga}, to employ a pentode instead of a triode, for in this case the value of C_{ga} would be several orders of magnitude lower than for a triode.

WERNER KLEEN.

FUELISHED
MAY 18, 1943.
BY A. P. C.

W. KLEEN
AMPLIFIER CIRCUIT FOR ULTRA-SHORT WAVES
Filed June 3, 1941

Serial No.
396,379

Fig. 1

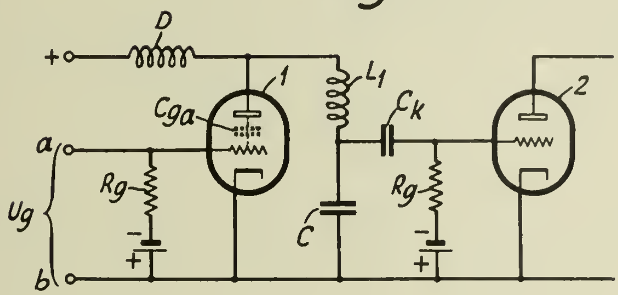


Fig. 2

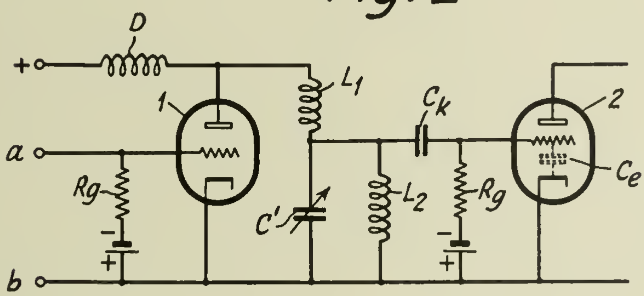
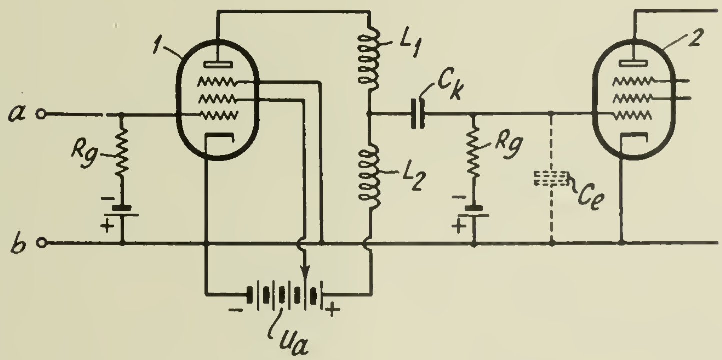


Fig. 3



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ALIEN PROPERTY CUSTODIAN

RESILIENT CONNECTION OF A WHEEL SUSPENSION OR AN AXLE AGGREGATE TO THE FRAME OR THE BODY OF A VEHICLE

Béla Barényi, Vaihingen-Rohr A. D. F., and Karl Wilfert, Sindelfingen, Germany; vested in the Alien Property Custodian

Application filed June 7, 1941

The present invention relates to a resilient connection of a wheel suspension or an axle aggregate to the frame or the body of a vehicle, especially for vehicles with gauge altering oscillating halfaxles.

Devices for resiliently connecting a wheel suspension or an axle aggregate to the frame or the body of a vehicle are described in the copending application "Resilient connection of a wheel suspension or a suspension of an aggregate of an axle to a vehicle" of the same inventors, according to which the wheel suspension or the axle aggregate is guided by a link quadrangle actuated by springs and swingably arranged in a substantially vertical plane in such a manner, that the wheel suspension or the axle aggregate may yield transversely to the direction of drive relatively to the frame or the body of the vehicle. This connection consists in an aggregate of axles connected to a cross member and also connected with the latter by means of the usual spring suspensions, the cross member being additionally connected with the vehicle by a member independent from the before mentioned spring suspension, which can yield substantially transversely to the direction of drive as well as upwardly, but showing a very small resiliency at the uttermost in other directions.

The present invention relates to an improvement of such resilient connections and substantially consists in so arranging the links of a link quadrangle, preferably a parallelogram with regard to the transverse plane extending through the centre of the wheels that the two connecting joints of each link are arranged on different sides of the transverse plane. This arrangement has the advantage that the forces transmitted from the wheels upon the frame or the body of the vehicle may cause the smallest possible bending and tilting moments only in the joints of the connecting links.

Preferably simultaneously a resiliency in the direction of the axis of the joints or a resiliency in all directions respectively is provided for instance by arranging rubber sleeves in the joints of the link quadrangle. The links may be U- or H-shaped to adapt them to more advantageously receive the forces to be transferred, the guide members or the driving shafts of the wheels respectively being passed between the vertical webs of the links containing the connecting joints. In this case preferably two rubber sleeves are arranged axially to and in spaced relation from each other, one being provided at the lower and the other at the upper end of the vertical web (serving as bearing) of the U- or H-shaped link. The axes of the joints of the links may extend vertically or under a certain angle to the vertical, particularly in the direction of shock of the wheels.

Moreover, instead of only connecting one axle to the frame or the body of the vehicle the link quadrangles may also advantageously serve to connect individual sections of a subdivided frame or body of a vehicle, whereby one of the sections simultaneously is formed as support of an axle aggregate. Furthermore, the axle aggregate with the entire driving block including the motor may be combined to a unit which is resiliently connected to the rest of the frame or the body of the vehicle by the link quadrangle swingably arranged in the horizontal plane.

In connection with vehicle bodies subdivided in sections and provided with a joint between adjacent sections obliquely arranged to the track or road, it is, moreover, of advantage to arrange the axes of the joints of the links substantially in parallel to the said joint.

In the accompanying drawings two constructions according to the invention are diagrammatically shown by way of example.

In these drawings:

Fig. 1 is a side elevation of a resilient connecting device according to the invention,

Fig. 2 is the plan view of the construction shown in Fig. 1,

Fig. 3 is a side elevation of a second construction according to the invention, and

Fig. 4 shows the plan view of the device illustrated in Fig. 3.

In the construction shown in Figs. 1 and 2 the rear end of the frame 1 is forked. At the ends of the forked arms vertical pivots 2 are arranged upon which are mounted by means of vertical webs 6 U-shaped links 5 open at the lower end. Between said webs and said pivots annular rubber buffers 3 and 4 are provided. Preferably the inner surface and the outer surface respectively of the annular rubber buffers 3 and 4 are rigidly connected, for instance by vulcanization, to the vertical pivot 2 and the tube-like web 6 of the link 5 respectively. Due to this arrangement the links 5 may yield about the axis of the pivot 2 to a limited extent against the action of the rubber buffers 3 and 4. The bearing simultaneously may be such that a resiliency in all directions may be obtained without metallic contact occurring between the pivot 2 and the link 5.

Furthermore, the other end of the link 5 formed by the vertical web 7 of the U-shaped link is

hingeably connected by a vertical pivot 8 to a vat-like frame plate 9 with or without interposition of rubber buffers in such a manner that the frame 1 together with the frame plate or the vat 9 and the two lateral links 5 forms a link quadrangle adapted to swing in a horizontal plane. A driving motor 10 is fixed upon the vat 9 for instance at three or four points with interposition of suitable rubber buffers or other elastic members. At the front side of the driving motor the driving aggregate, consisting of the change speed gear 11 and the axle gear 12, is connected in such a manner as to lie within the space between the fork of the frame 1, the vat 9 and the lateral links 5 of the horizontal link quadrangle. The rear wheels 13 are journalled upon half axles adapted to swing which are linked laterally to the axle gear 12 in such a manner that they may swing up and down within the space between the two vertical webs 6 and 7 of the U-shaped links 5.

The shock absorption of the wheels may be effected in any desired manner preferably so that the springs bear against the driving block 10, 11 and 12 or against the vat 9, respectively. Eventually, however, the ends of springs, for instance non-guided coiled springs, facing the frame may directly or with interposition of movable intermediate members bear against the frame 1. The bearing of the springs against the driving block or the vat 9, however, has the advantage that the forces and shocks absorbed by the springs may be transferred upon the frame 1 or the body of the vehicle only after being dampened by the rubber buffers 3 and 4.

Due to the arrangement of the link quadrangle adapted to swing in the horizontal plane and formed by the links 5, the transverse movements and transverse shocks, occurring during elastic deflection of the oscillating half axles 14, may be compensated by lateral yielding of the driving aggregate or the vat 9 respectively, so that the frame or the body of the vehicle may substantially remain unaffected by these transverse shocks and transverse movements.

The construction shown in Figs. 3 and 4 differs from the construction described above substantially by the fact that instead of a special frame 1 a self-supporting carriage body 15 is provided which is connected to the rear section 16 of the body on the vehicle by the H-shaped links 17. The pivots 18 and 19 of the connecting joints of the links 17, furthermore, are not arranged vertically to the track or road but about in the direction of shock of the wheel and about in parallel to the separating joint 20 between the sections 15 and 16 of the body of the vehicle. For the rest, the arrangement is the same as in the case of the construction according to Figs. 1 and 2, the driving aggregate 10, 11, 12 being mounted upon the rear section 16 of the body of the vehicle.

Due to the fact that the oscillating half axles 14 are passed between the joints 2 and 8 of the links 5 or between the joints 18 and 19 of the links 17 respectively, i. e. that the joints of the links are arranged at both sides of a substantially vertical transverse plane extending through the centers of the wheels, the links are particularly slightly strained by the wheel pressures occurring, so that a high safety in the connection of the axle aggregate or the portion of the vehicle connected to the axle aggregate respectively to the rest of the vehicle is ensured.

Axle aggregate according to the invention means an axle with two wheels together with the axle drive, the change gear and the motor. A part of an axle aggregate means therefore e. g. the axle with the two wheels or this part together with the axle drive or these two parts with the change gear.

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BY A. P. C.

B. BARÉNYI ET AL
RESILIENT CONNECTION OF A WHEEL SUSPENSION OR AN AXLE AGGREGATE TO THE FRAME OR THE BODY OF A VEHICLE
Filed June 7, 1941

Serial No. 397,009

Fig. 1.

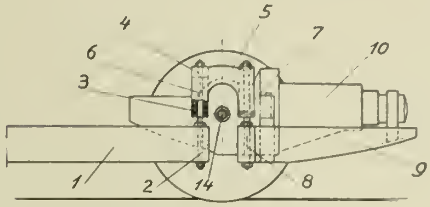


Fig. 2.

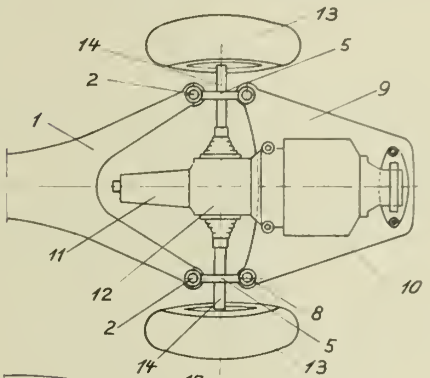


Fig. 3.

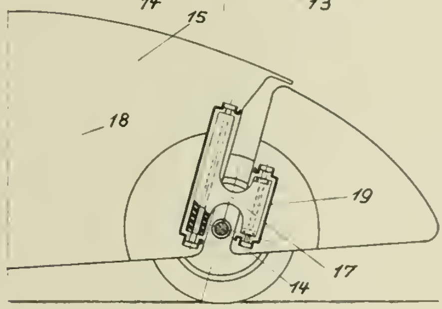
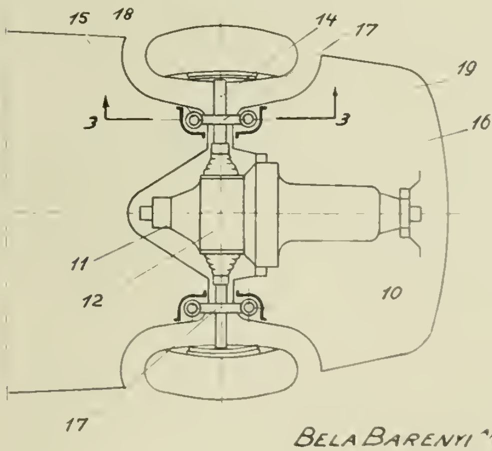


Fig. 4.



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ALIEN PROPERTY CUSTODIAN

CONDENSERS

Heinrich Zodtner, Birkenwerder, Germany; vested in the Alien Property Custodian

Application filed June 12, 1941

Condensers are known which have a tubular ceramic dielectric provided inside and outside with a sliver coating. In order to increase the capacity value and the load capacity a number of such tubular condensers may be soldered to two end plates.

These arrangements lack a ventilation suitable for insuring a good heat emission, because air can enter only the interior of the condenser tubes but cannot act on their outer surface.

In order to avoid this drawback, condensers as provided by the present invention comprise ceramic condenser plates, that is, ceramic plates fitted with metal coatings, and side members carrying these plates. The novel arrangement is such that all of the surfaces of the condenser plates shall be swept by air in a manner to effect a good heat emission.

In the drawing, Fig. 1 is an elevation of one form of the novel condenser, while Fig. 2 is an end view and Fig. 3 a plan view thereof.

On a base plate 1 two side members 2 are fastened by suitable means, such as screws, for instance. The members 2 are provided with slots in which the ceramic condenser plates 3 are inserted. Preferably, the members 2 are of well conducting material, in order electrically to interconnect the coatings, not shown, of the plates 3, and they may be obtained from a metal piece by punching and pressing.

The members 2 may, however, be formed integral with plate 1, that is to say, may likewise consist of ceramic material. In this case the slots thereof are to be coated with silver or copper before the plates 3 are inserted in these slots. In order to provide for a close contact between the parts 2, 3 recesses 4, preferably semi-cylindrical in shape, may be cut into the members 2 in order that the parts 2, 3 may be soldered together in these recesses, namely, at the curved edges of the said slots.

The space requirements of the novel arrangement may be made to be small compared with those of the prior arrangements, since the plates 3 may be located in close adjacency of each other on account of the good heat emission peculiar to the novel device. They may even be placed against each other loosely, that is, without pressure, and be soldered together at the two edges that serve for connecting the condenser, these plates 3 thus being interconnected to constitute a rigid block-shaped structure.

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CONDENSERS
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FIG 1

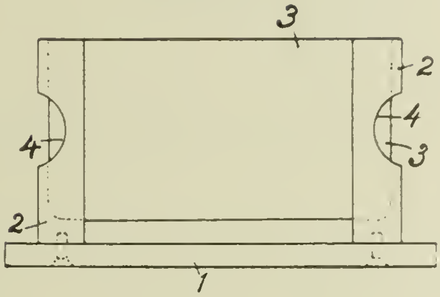


FIG. 2

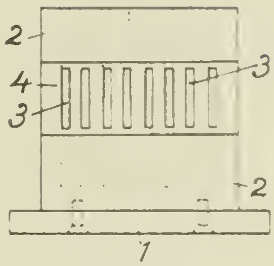
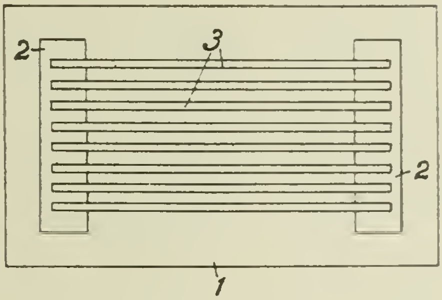


FIG. 3



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Serial No. 397,704

ALIEN PROPERTY CUSTODIAN

RADIO CABLES

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Application filed June 12, 1941

The present invention has for its object to create a wide-band radio cable of constant attenuation, that is, a cable suitable for distortionless transmission as regards frequencies up to a certain value.

According to the invention the internal conductor, formed as a tubular conductor, and the outer conductor of the cable consist of radio strands so constructed that the limiting frequency is a multiple of the highest working frequency. Preferably, the insulating compound of the cable is plastical and has a leakance constant less than 10^{-3}.

These and other features of the invention will be understood from the following description and the accompanying drawing, which is a diagrammatic fragmentary elevation of a form of cables as provided by the invention.

The tubular internal conductor **2** consists of interlaced radio strand and is seated on a hemp-cord **1**. **3** denotes a plastic insulating compound of low losses, in which the conductor **2** is embedded in a manner to avoid any air cavities between the two. The outer conductor **4** likewise consists of interlaced radio strand and is mounted on the insulating compound **3**. In the case shown by way of example the conductor **4** is surrounded with an insulating sheath **5** that may be of the same material as the compound **3** by which the conductors **2**, **4** are insulated from each other. A protective sheath **6** for the insulating sheath **5** may be made of any suitable artificial material.

As will be seen in the drawing, the strands forming the conductors **2**, **4** are each arranged at right- and left-hand lays in order that the magnetic field outside conductor **4** be substantially neutralized.

Preferably, in order to provide for a good utilization of the cable and an economical manufacture thereof, the conductors **2**, **4** may be made of wires different in thickness but so calculated that both conductors **2**, **4** are given the same limiting frequency. The eddy current factor may be assumed approximately to be

$$1+\left(\frac{\omega}{\omega_0}\right)^2$$

where $\omega=\omega_0$ is the limiting frequency for the cable. In the case of the novel cable

$$\frac{\omega}{\omega_0} \text{ is} < 10\%$$

which means that ω may acquire values up to $\frac{1}{3}\,\omega_0$.

Another advantage of the novel cable is that the axial fields are neutralized, whereby the attenuation of the cable is independent of frequency. Also, owing to the use of the aforesaid special insulating compound and of the described construction of conductors **2**, **4** the diameter of the cable and the weight thereof may be made to be very small. For instance, the weight of 1000 meters of a cable whose outer diameter is about 27 millimeters is about 700 kilograms. The small cross-sectional area of the cable is also due to the fact that there is no air space insulation. In this regard therefore the invention entails a considerable saving in material. Equally, any lead sheath may be dispensed with. The sheath **6** of artificial material, which for instance may be composed of interlaced tapes, allows the cable to be buried in the same manner as a cable equipped with lead sheath and armouring.

Attenuation tests regarding a cable of this kind and relating to a frequency range of from 60 to 1300 kilocycles per second have given the following results: with 300 kHz, that is, 300 kilocycles per second, an attenuation, independent of frequency, of about 72 mN/km, that is, 72 millinepers per kilometer, was obtained. From 300 kHz onward the attenuation rises. For instance, with about 600 kHz it amounts to 85 mN/km, with 1000 kHz to 126 mN/km, and with 1300 kHz to 160 mN/km. It will thus be seen that with 300 kHz the attenuation solely depends on the ohmic resistance of the conductors **2**, **4** and that even in the case of higher frequencies the leakance loss does not appreciably affect the total attenuation. For example, with 200 kHz the leakance loss is 1.6%, while with 400 kHz it is 3.7% and with 1000 kHz it amounts to 8.5% of the total attenuation.

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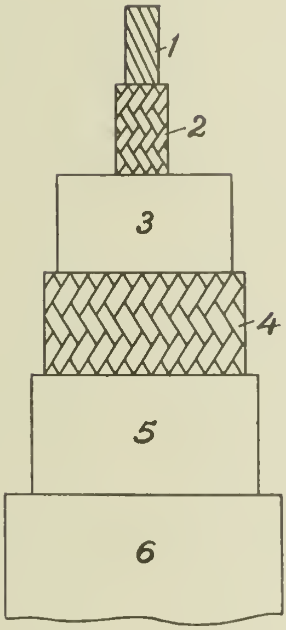

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BY

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ALIEN PROPERTY CUSTODIAN

AUXILIARY MOTOR DEVICES FOR DRIVING LIGHT VEHICLES

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Application filed June 12, 1941

The present invention relates to auxiliary motor devices for driving light vehicles (such as bicycles, tricycles, invalid cars, etc.), these devices being of the kind including an auxiliary motor driving one of the wheels of the vehicle through a roller acting by contact and adhesion on said wheel.

The object of the present invention is to provide a device of this kind which is better adapted to meet the requirements of practice than those used up to the present time, and, in particular which ensures a permanent and better contact of the wheel to be driven and the driving wheels.

According to a feature of the present invention, such a device includes elastic means interposed between, on the one hand, the means for supporting the roller above mentioned, and, on the other hand, a part (either fixed or pivoting) of the frame or chassis of the vehicle, so as to apply said roller with a predetermined pressure against the wheel to be driven, the device further including retaining means (constituted by a locking system, a dash-pot, an adjustable abutment, a ratchet system or the like) for maintaining the desired pressure of application of the roller or rollers on the wheel and opposing or preventing any movement which might tend to bring the roller away from the wheel.

According to another feature of the present invention, the wheel is driven by the motor device above referred to through two or more rollers simultaneously driven by the motor and one of which is advantageously directly driven by the motor (for instance mounted on the shaft of said motor), the support of these rollers being pivotally mounted in such manner to a part of the vehicle frame that the pressure exerted on the wheel to be driven is distributed, in a substantially equal manner, among the various rollers.

According to still another feature of the invention, the wheel is driven by a motor device of the type above referred to through two rollers, one of which is advantageously directly driven by the motor, about the peripheries of which a belt is stretched so as to drive the wheel by adhesion, and the whole is mounted in such manner, with respect to the frame of the vehicle, that the pressure exerted on the wheel to be driven is distributed, in a substantially uniform manner, over the whole length of the portion of said belt which is in contact with the wheel.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a side view of a motor device for use on a bicycle, made according to a first embodiment of the invention;

Fig. 2 is a front elevational view corresponding to Fig. 1;

Fig. 3 is a side view showing a modification of such a device;

Fig. 4 is a view, similar to Fig. 3, showing another modification;

Fig. 5 is a side view, similar to Fig. 1, showing another motor device made according to a second embodiment of the invention;

Fig. 6 is a plan view corresponding to Fig. 5, the bicycle being not shown;

Fig. 7 is a view, similar to Fig. 5, showing a third embodiment of the invention;

Fig. 8 is a view, similar to Fig. 7, corresponding to Fig. 7.

In the following description, the invention will be set forth as applied to the case of a bicycle which is to be fitted with an auxiliary motor device of the type above mentioned.

However, it should be well understood that the invention is not in any way limited to this application and that any light vehicle can be driven through identical or analogous means.

Furthermore, it has been supposed, in the following description, by way of example, that the motor used for driving the bicycle in constituted by an internal combustion engine of any suitable type. As this engine in itself does not constitute the subject matter of the invention, it has been deemed unnecessary to show all the parts thereof in detail and the drawings merely show the engine proper, at 1, the fuel tank 2, the exhaust pipe 3, and the fly-wheel 4.

The whole of this driving engine and of the parts associated therewith, which will be hereinafter called "motor unit," is pivoted, through an axis 7, to a support 8 fixed through any suitable means 9 to the arms of the steering fork of the bicycle.

Preferably, these fixation means are constituted by straps secured by means of bolts, with the interposition of rubber or similar sleeves between said straps and the arms of the fork which support them.

In the embodiments of the invention illustrated by Figs. 1 to 4, it has been supposed that the wheel 5 of the bicycle is driven through a single roller 10 bearing upon the tire 11 of said wheel. This roller is directly fixed on the shaft

of the engine but of course it might be driven by said engine through any suitable drive, such for instance as gear wheels, a belt, a chain, etc.

There are known motor devices of this kind, but they have the disadvantage that, as a consequence of the shocks produced by the rough surface of the road, the inertia effects undergone by the motor unit and transmitted to roller 10 are opposed only by the weight of said motor unit, so that the pressure of roller 10 on tire 11 is variable. It follows that, when engine 11 and roller 10 are thrown upwardly by a shock, the adhesion of the roller decreases, so that the engine will race. In this case, when the roller is again brought back into contact with the tire, there is considerable slipping between them and the resulting friction is a cause of rapid wear and tear of the tire.

According to the present invention, adhesion between the driving roller 10 and the wheel tire 11 is obtained not only by the weight of the motor unit pivoted at 7 to support 8 but also by the action of springs such as 12 interposed between, on the one hand, said motor unit at 13, and, on the other hand, said support at 14. The spring or springs are given a suitable preliminary tension so as to produce the best possible pressure for driving wheel 5 by adhesion.

Advantageously, the means 13 for fixing springs 12 to the motor unit are advantageously constituted by pins carried by said motor unit and engaged, in a slidable manner, in arcuate slots 15 provided in arms belonging to support 8. It follows that the motor unit is urged by springs 12 in such manner that the position of roller 10, when said roller is applied on tire 11, permits of obtaining the best possible pressure, pins 13 moving in slots 15.

In order to oppose or to prevent any angular movement of the motor unit with respect to axis 7 under the effect of shocks taking place when the bicycle is running and in order to maintain the best possible pressure obtained as above explained, I make use of locking or braking means which may, for instance, be made as follows:

In the embodiment of Figs. 1 to 2, these means consist of positive locking means and they are constituted by a screw 16 having a butterfly head, engaged in a passage provided in a portion 17 of the motor unit located between the arms of support 8. This screw is adapted freely to slide in arcuate slots 17 provided in said arms on either side of said portion 17.

Screw is so positioned that it can easily be reached by the cyclist's arm, whereby the latter can, without difficulty, operate said screw so as either to release, or, on the contrary, to lock the motor unit. If the cyclist is careful, from time to time, to release said locking screw 16 and then again to screw it, the motor unit is automatically adjusted in the proper position with respect to the wheel, whatever be the degree of inflation of the tire thereof.

In the modification illustrated by Fig. 3, the locking screw 16 is replaced by a dash-pot which prevents relative movement of the motor unit with respect to the wheel in only one direction, to wit that corresponding to a displacement of the roller away from the wheel.

In this embodiment, the cylinder 18 of the dash pot is fixed to support 8 and the piston 19 thereof, provided with a check valve 20, is carried by the motor unit, or inversely. The circulation of oil or the like through said dash-pot device is arranged in such manner that the upward movement of piston 19 is braked, while the downward movement thereof takes place freely owing to the fact that check valve 20 then opens.

I might also replace the uni-directional braking device constituted by the dash-pot by any other equivalent hydraulic or mechanical means, for instance by making use of a ratchet system including on the one hand a rack rigid with support 8 and, on the other hand, a pawl carried by the motor unit, or inversely, or any other equivalent mechanical system.

In the modification shown by Fig. 4, the uni-directional retaining means are constituted by adjustable abutment 21, formed by a threaded rod, provided at the top with a hand-wheel 21*a*, and carrying a nut 21*b* for fixing it in a predetermined position with respect to support 8, by which it is carried. This threaded rod cooperates with a projection 22 carried by the motor unit and so positioned that, when the adjustable abutment 21 is in contact with said projection 22, the upward displacement of said motor unit about axis 7 is positively prevented.

It should be noted that the object to be obtained, when making use of the retaining means above described, is not to prevent too deep a depression of the tire by the roller but to oppose too considerable a rebounding under the effect of a shock due to the uneven surface of the road. As a matter of fact, if the motor unit thus rebounds, when the roller is brought back into contact with the roller, due to the very high speed of revolution imparted thereto by the engine which is then racing, produces a very injurious friction on the wheel tire, due to the great difference of the velocities of said roller and said wheel tire when they come back into contact with each other.

It might be objected that such a fixation device does not permit of disconnecting the engine from the wheel by moving roller 10 away from tire 11 through a pivoting displacement of the motor unit with respect to support 8 about axis 7. It is known that there are systems including a pivoted motor unit owing to which the cyclist, by acting on a handle within reach of his hand, can lift the motor unit clear from the tire and thus destroy any contact between the wheel and the driving means (such as roller 10). It should be noted that, in all systems of the type with which the invention is concerned, such an operation is unnecessary because it suffices to open a pressure relief valve provided on the engine. As a matter of fact, it is interesting, in order to reduce the fuel consumption to a minimum, to connect the means for controlling this valve with the means for controlling the feed of fuel so that the fact of opening this valve simultaneously stops the feed of fuel to the engine for the whole period for which the pressure is thus reduced.

Experience has taught that, when use is made of a single roller the diameter of which is necessarily small, in order to obtain the pressure of application of said roller on the tire necessary for ensuring the drive, the weight of the motor unit and the tension of springs 12 must be given values such that the roller projects deeply into the tire and thus causes a quick wear and tear thereof. According to the present invention, this drawback is avoided by making use of several rollers.

In Figs. 5 to 8 of the drawings I have shown several embodiments of such arrangements, in which use is made of two rollers of the same diameter, one of which, 10^1, is advantageously fixed

on the engine shaft, although this is not necessary.

In order that the pressure of rollers 10^1 and 10^2 on tire 11 may be equally distributed, each of these rollers must be subjected to the action of a spring, 8^1 and 8^2 respectively, fixed at one end to the roller and at the other end to support 8. The point of fixation 23 of the springs to said support 8 is advantageously so positioned that the action exerted by these springs is substantially perpendicular to the periphery of tire 11. The axes of rollers 10^1 and 10^2 are engaged in spacer plates 24 pivoted at the middle thereof on a locking screw 16 analogous to that above described with reference to Figs. 1 and 2 and also movable in arcuate slots 17 provided in support 8. Owing to this arrangement, after the butterfly head of this locking screw 16 has been loosened, the whole of plates 24 and rollers 10^1 and 10^2 is applied with a predetermined pressure, under the effect of springs 12^1 and 12^2 against the tire, with an equal distribution of the pressure of application of the rollers on the tire, after which it suffices to fix the system of rollers by tightening screw 16. I might make use of any other retaining means, such for instance as those above described with reference to Figs. 1 to 4, for obtaining the same result.

A belt or chain 25 interconnects pulleys 26 respectively fixed on the axes of rollers 10^1 and 10^2 so that the latter may be driven at the same speed.

In the embodiment illustrated by Figs. 7 and 8, I engage on the peripheries of rollers 10^1 and 10^2 a belt 27 which not only serves to drive both of the rollers at the same speed but also permits of increasing the surface of contact between tire 11 and the driving rollers. It will be readily understood that the portion of belt 27 which is located between rollers 10^1 and 10^2 and tire 11 permits of obtaining an area of contact substantially greater and, consequently, a better adhesion. Furthermore, owing to the provision of springs such as 12^1 and 12^2 arranged above explained, I obtain a substantially uniform distribution of the pressure over the whole area of this portion of the belt and this uniform distribution will be preserved owing to the provision of retaining means, such as locking screw 16, when the latter is tightened.

I might apply any of the arrangements above described for obtaining a variable speed reduction ratio of transmission. Such a system would consist of a plurality of driving means, having respective rollers of different diameters, made as above described, and each provided with retaining means of the kind of those above described, any one of these driving means being brought into action by fixing its support, pivoted to the frame or to a support mounted thereon, in a position of operation, while the other driving means are brought out of action by keeping them in a position such that their respective rollers are out of contact with the wheel to be driven.

It must be noted that the center of gravity of the motor unit must be located substantially in the median plane of the wheel, which can easily be obtained by placing the engine on one side, and the fly-wheel, preferably a magnetic one, on the other side of the wheel. Likewise, the fuel tank 2 is preferably mounted symmetrically with respect to the median plane of the wheel so that the variations of weight of this tank have no influence on the relative position of the center of gravity of the whole with respect to said median plane. Also, the axis of the exhaust pipe 6 of the engine should be substantially in line with the pivot axis of the motor unit and an articulation should be provided for said exhaust pipe close to this point so that its lower part may remain substantially stationary while the engine oscillates slightly about this axis 7 while the vehicle is running.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

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Filed June 12, 1941

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3 Sheets-Sheet 1

Fig. 2

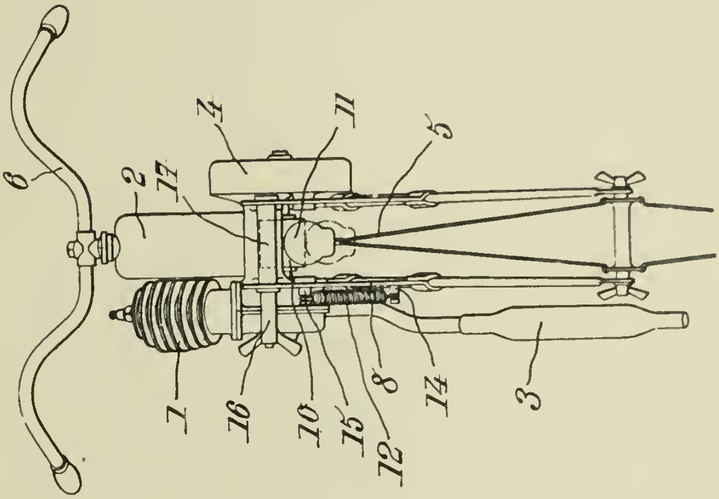
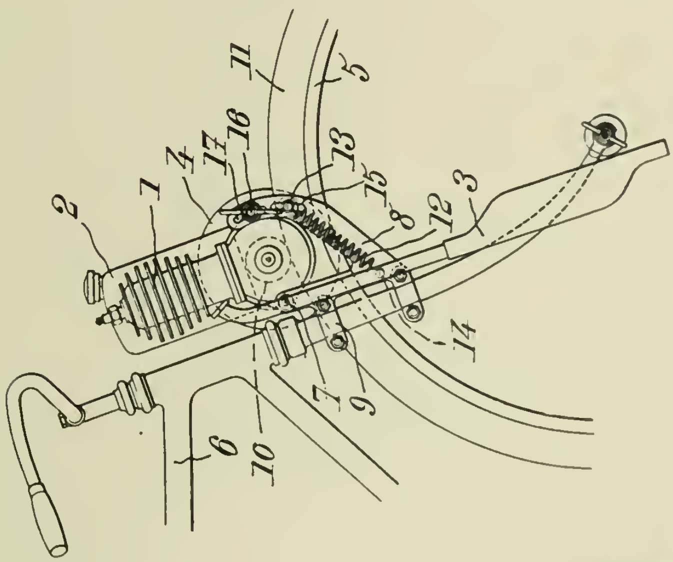


Fig. 1



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397,812
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Fig. 7

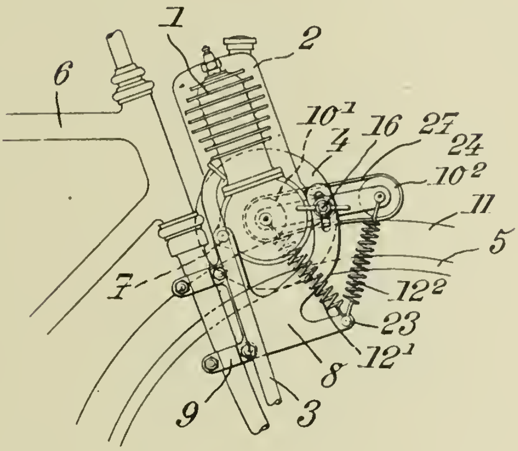
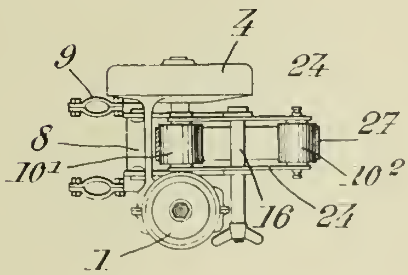


Fig. 8



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AUXILIARY MOTOR DEVICES FOR DRIVING LIGHT VEHICLES

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3 Sheets-Sheet 3

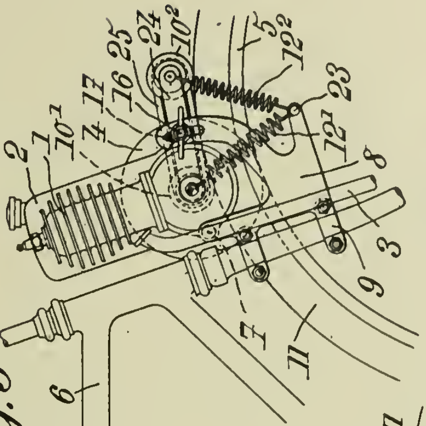

Fig. 5

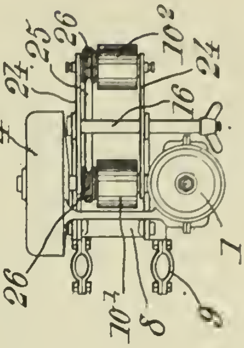

Fig. 6

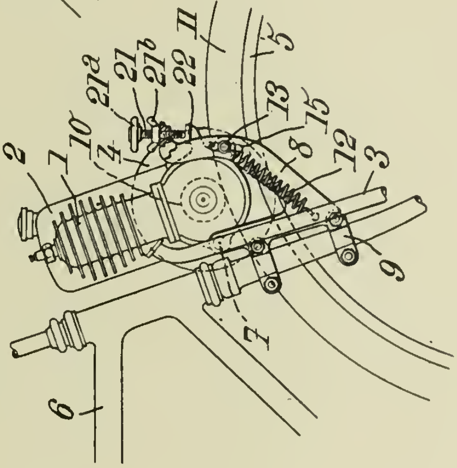

Fig. 4

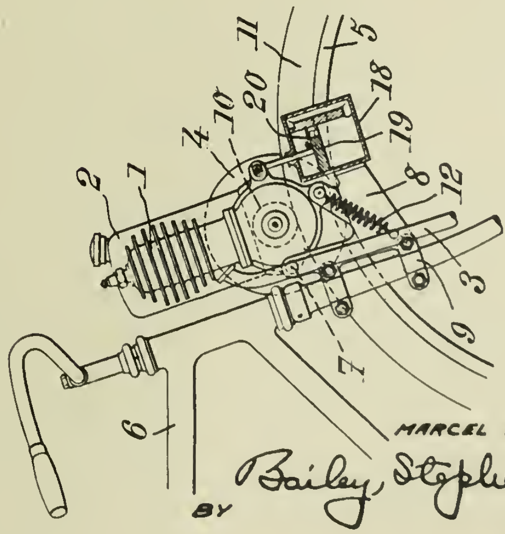

Fig. 3

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ATTORNEYS

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ALIEN PROPERTY CUSTODIAN

INTERNAL COMBUSTION ENGINE

Ludwig Seitz, Augsburg, Germany; vested in the Alien Property Custodian

Application filed June 16, 1941

This invention relates to an internal combustion engine, particularly one used in driving vehicles, and has for its object to arrange the collecting spaces for the lubricating oil and also the oil pumps in a manner insuring uninterrupted feeding of oil to the engine.

It has frequently been noted that when engines of automotive vehicles, as motor cars, aircraft and boats, occupy an inclined position for some time the oil feed is interrupted, which is due to an unsuitable arrangement of the oil collecting spaces and of the oil pumps. The oil collects at the points of the sump that are located at the lowest level for the time being and is thus not available at times at the suction point of the pump while the engine is in this position.

The invention eliminates this defect by subdividing the sump from which oil is delivered to the engine in such manner that at both ends of the sump separate oil collecting spaces are provided besides a main oil space located between them. An auxiliary pump delivers the oil from each end chamber into the main space from which another pump feeds it to the engine.

In such an arrangement the position occupied by the engine relative to the horizontal is immaterial, since the main space always contains enough oil to permit continual operation of the main pump, which is due to the fact that one of the auxiliary pumps invariably delivers oil to that space. The three pumps are so constructed that their cases containing also the necessary short suction and pressure pipes can be screwed from below to the crankcase, and the housings of the two auxiliary pumps act as cross members for bracing the two longitudinal base plates of the crankcase. The pumps are driven by a joint shaft running parallel to the crankshaft. In order to make the main space large enough for all requirements the lower portion of the crankcase, in further accordance with the invention, possesses in its longitudinal sides additional oil receptacles which directly communicate with the main oil space and into which the two auxiliary pumps discharge without the interposition of pipings.

The arrangement of the oil collecting spaces and of the pumps as contemplated by the invention, besides insuring without fail a constant supply of lubricating oil to the consuming points of the engine, affords the following advantages: Suitable construction of the general pumping plant and of the individual pumping sets, omission of pipings up to the pressure connection of the main pump and favorable utilization of the space available for providing the largest possible amount of lubricating oil.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is a longitudinal section of the lower part of the crankcase and sump;

Fig. 2, a cross section of the lower part of the crankcase and sump taken on a level with the main pump on the line II—II, of Fig. 1; and

Fig. 3, a cross section of the lower part of the crankcase and sump taken on a level with an auxiliary pump on the line III—III, of Fig. 1.

To a crankcase 1 a sump 2 is secured in the usual manner and subdivided by partitions 3 to form a central space 4 and two end chambers 5. The two end chambers 5 communicate with each other through a space 5*a* and contain each an auxiliary pump 6 which directly draws its oil from its respective end chamber 5. The oil from the central space 4 is delivered by a main pump 7. All three pumps 6 and 7 are driven by a common shaft 8 with the aid of gear wheels 9, 10 and a crankshaft 11.

In the example shown, the pumps are gear driven and with their housings 12, 13 and the cast-in suction and pressure pipes secured from below in the crankcase 1. The housings of the pumps 6 form cross members for bracing the two longitudinal plates of the crankcase 1. The pumps 6 deliver their oil collecting in the end chambers 5 to one of the additional oil spaces 14 provided in the longitudinal sides of the crankcase 1 and communicating with the main oil space 4 through openings 15. From the main oil space 4 the pump 7 forces the oil through a pressure connection 16 cast into the crankcase 1 and through a connecting piping, not shown, to the consuming points of the engine, possibly after it has passed through coolers and filters, not shown.

LUDWIG SEITZ.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

L. SEITZ

INTERNAL COMBUSTION ENGINE

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FIG.3

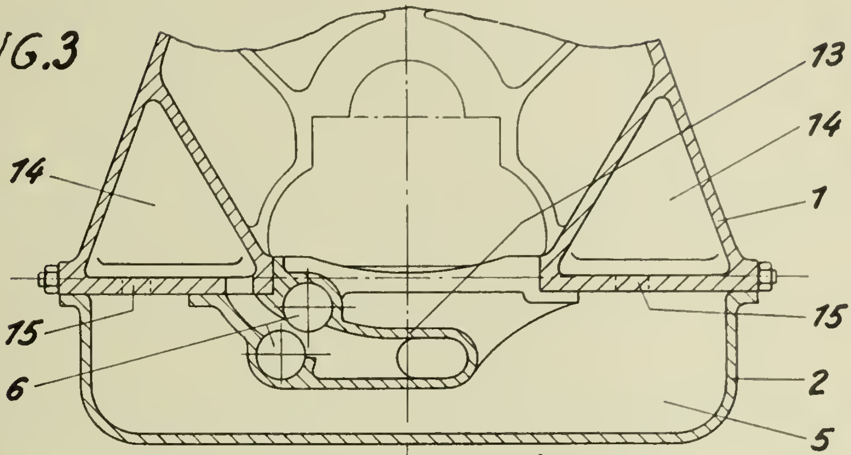


FIG.2

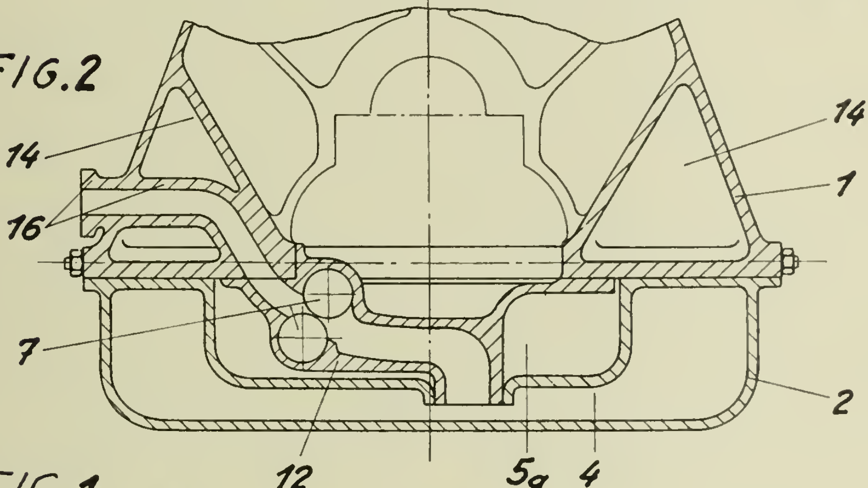
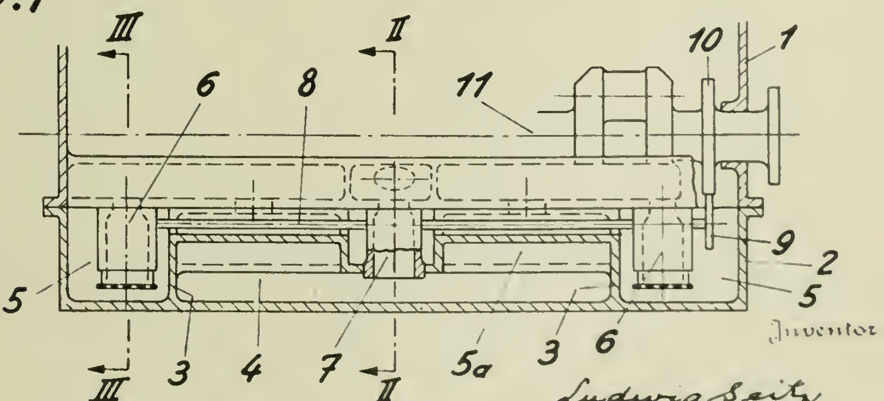


FIG.1



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ALIEN PROPERTY CUSTODIAN

AIR FILTER

Ludwig Seitz, Augsburg, Germany; vested in the Alien Property Custodian

Application filed June 16, 1941

This invention relates to an air filter forming a vortex, and particularly to a filter of this type intended for use in internal combustion engines.

The known kinds of filters of this class possess a drum-like or similarly shaped casing at the bottom of which the drawn in air enters in tangential direction, passes along the walls thereof and comes out again at the cover in the center. Owing to the formation of an air vortex inside the filter the oil is entrained and rises on the walls due to centrifugal force with the result that a large contact surface between air and oil is produced whereby the air is deprived of dust which combines with the oil. At its emergence the air is separated from the oil by means of fine screens, filter masses, etc.

These known air filters are, however, open to the objection that their efficiency is determined by the size of the drum surface, so that larger engines require several filters for handling the amounts of air needed. While such an arrangement may be tolerable in case of some stationary engines, it cannot be used in numerous other instances, and particularly not in drives for vehicles, because room is lacking for accommodating air filters of the requisite size.

The drawbacks mentioned are overcome according to the invention by constructing the vortex casing of the filter in the form of a multiple spiral, i. e., by fitting into each other several spiral casings and thereby arranging a plurality of air filters within a very small space in a common casing, the amount of space saved being so large that the air filter, even for maximum requirements, can be easily placed anywhere.

The provision of a multiple spiral in the vortex casing affords, however, still another advantage. By fitting the side walls of the various spiral channels formed with slots extending transversely to the direction of air flow a portion of the filter oil rising on these walls due to centrifugal force will be caused to pass into and transversely through the adjacent external channel to the outer side wall thereof. The oil thus forms a dense mist through which the air in the adjacent outer channel is conducted and thereby still more intensely purified. Furthermore, the slots prevent the accumulation of too much oil in the center of the casing, since part of the oil always flows off through the slots into a remoter outward portion of one of the other spiral channels.

One form of the invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is an axial section through an air filter according to the invention; and

Fig. 2, a cross section on the line II—II of Fig. 1.

The filter casing 1 possesses three spirally extending channels 2, 3 and 4 arranged one within the other. The drawn in air enters at the open inlets 5 of the outer circumference of the casing 1 and, due to suction draft, flows to the center thereof. The oil contained in the casing 1 is entrained and, owing to centrifugal force and the inclined walls of the channels 2, 3 and 4, rises on these walls, so that a large contact surface between oil and air is produced. Fig. 1 indicates the oil level when the filter is not in use. The amount of filter oil to be supplied may be varied to suit requirements.

The side walls of the channels 2, 3 and 4 possess slots 6 through which the entrained oil moving up on the outer walls of the channels passes into the adjacent outer channel and crosses it while travelling to the external wall thereof. Through the oil mist formed in this manner all the air contained in the channel concerned must pass and is thus filtered in an extraordinarily effective way. The edges 7, 8 of the slots 6 are preferably bent so as to facilitate the passage of the oil from one channel into another.

The air collects in the center of the filter casing 1 and thence flows off in upward direction. On its way to the outlet the air first moves through a screen 9 and then through the fine filters 10, whereby the oil contained therein is separated. The screen 9 and the fine filters 10 are easily detachably secured to the casing 1 by a rod 11, a spring 12 and a nut 13. A removable cover 14 permits the taking out of the screen 9 and of the filters 10 as well as cleaning of the casing 1. At 15 the purified air enters the conduit leading to the point of consumption, for instance the working cylinders of a Diesel engine.

LUDWIG SEITZ.

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L. SEITZ
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FIG.1

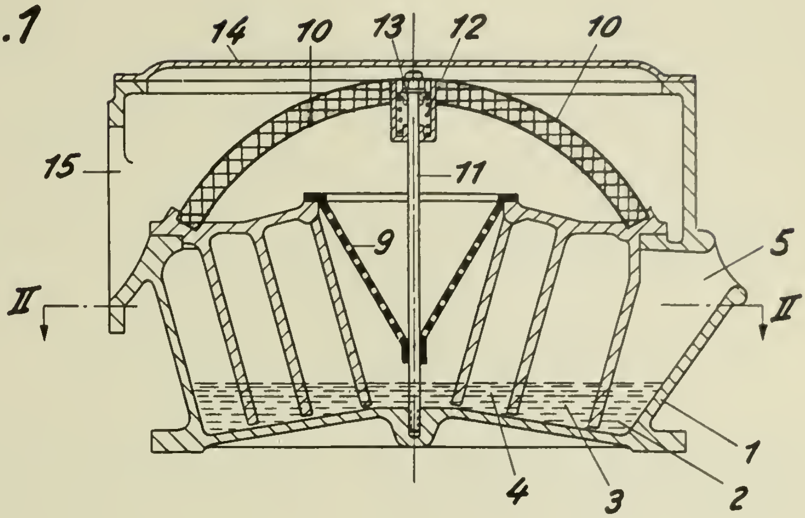
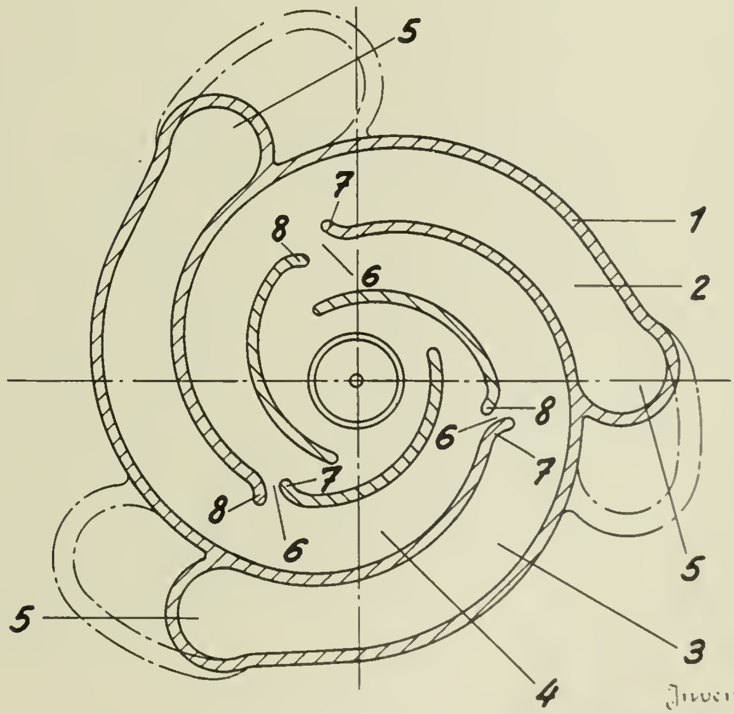


FIG.2



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ALIEN PROPERTY CUSTODIAN

ELECTRIC CONDENSER

Erwin Willwacher and Franz Sammer, Berlin, Germany; vested in the Alien Property Custodian

Application filed June 18, 1941

This invention is related to a novel differential condenser for short-wave apparatus in which ceramic material is employed for supporting, as well as for the dielectric. Condensers of this kind are particularly suited for short-wave arrangements. According to the invention, special care is taken so that no intense fields are able to arise at the edges of the capacity surfaces or coats, in fact, this is essential if corona and flashovers are to be avoided.

According to the invention, the condenser is designed in the following way: In a ceramic body are formed two preferably semi-circular cup-shaped depressions which are separated by a middle fin. In these hollows or depressions are metallic coats to serve as the capacitive surface which are connected with the output electrodes, care having to be taken so that the coats extend as far as the walls of the cup-shaped depressions. A similar coat arranged in a hollow or depression of a movable ceramic body (rotor) constitutes the co-operating electrode. Owing to the fact that the coats formed by an electro-plating process or by spraying extending all the way up the edges or walls of the hollows or depressions with the result that the distance between the edges of the coats is greater than the distance between the active portions of the capacity surfaces, the arising of high field intensities at the coat edges which are liable to lead to the difficulties beforementioned, are avoided.

An exemplified embodiment of the basic idea of the invention is illustrated in the three figures of the appended drawing. K denotes the ceramic body, which if a rotary condenser is concerned, has two cup-like depressions S1 and S2 each having a semi-circular base. These cup-shaped depressions are separated by a cross fin R. The coats B1 and B2 in a way as hereinbefore pointed out are extended all the way to the walls of the cup-shaped depression W. The variable co-operating electrode consists of a similarly designed coat B3 which is also semi-circular in plan and which is arranged in a depression of the rotary ceramic part K'. Parts K and K' for the sake of greater clarity of illustration are shown in Fig. 2 separated from each other rather than in contact. It will be noticed that the edges of the coats B1 and B2, and B2 and B3 are at a greater distance than the active portions of the coats so that the production of high field intensities at the edges of the coats is prevented. Where it is desirable that a comparatively large capacity portion of the condensers should be excluded from regulation then it will be advisable to make the fin R of greater length and to extend the coats B1 and B3 to a substantial distance up the two opposite surfaces of the fin R.

ERWIN WILLWACHER.
FRANZ SAMMER.

PUBLISHED	E. WILLWACHER ET AL	Serial No.
MAY 18, 1943.	ELECTRIC CONDENSER	398,524
BY A. P. C.	Filed June 18, 1941	

Fig. 1.

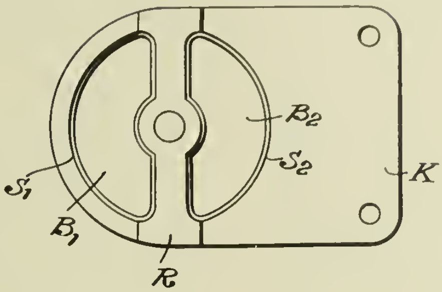


Fig. 2.

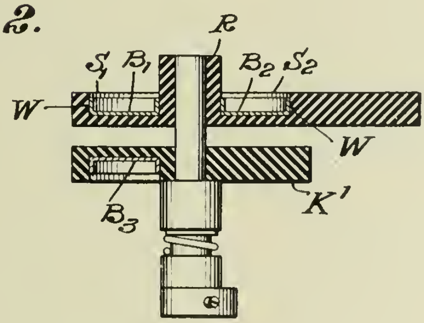
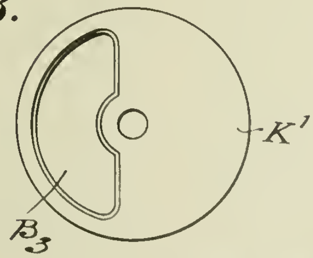


Fig. 3.



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ALIEN PROPERTY CUSTODIAN

REGULATING ARRANGEMENT

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Application filed June 18, 1941

The invention relates to a regulating arrangement for current- or voltage regulation in which, with the object of attaining the regulating effect, a direct current or an alternating current of relatively low frequency is transformed into an alternating current, preferably of medium or higher frequency, this alternating current of preferably medium or higher frequency being submitted to a regulation by a change of the periodicity, of the amplitude or of the phase relation.

The thus regulated alternating current is then retransformed again into direct current or into an alternating current of the original periodicity by a rectifying or modulating process.

In such arrangements it is possible, to use for the transformation of the direct- or primary alternating current into the alternating current serving as intermediate medium of the transformation, a tube arrangement, for instance with grid-controlled tubes filled with gases or metal vapours but in this case the loss of voltage occurring in the tubes may be undesirable.

Especially for avoiding this voltage drop but also for other reasons, for instance, for simplifying and cheapening the whole plant, the link circuits may preferably be, according to the present application, of capacitive, purely ohmic or only slightly inductive character, this facilitating then the employment of mechanical rectifiers, which permit of working with considerably lower internal voltage drop.

Several embodiments of the invention are illustrated by way of example in the figures of the accompanying drawings, in which in

Fig. 1 C designates the condenser, alternately to be charged and discharged, G the mechanical rectifier, which in this instance is shown as a vibrating rectifier, and M a motor to be regulated and assumed to be the load.

Fig. 2 shows a regulating drive according to the invention for a buss with overhead line, C representing the charging condenser, M the motor of the buss, MH an auxiliary motor, *Sch* a friction disc, *Fr* a friction wheel and H a regulating lever for tilting the friction disc *Sch* relative to the friction wheel *Fr*. A and B are the brushes of the rotating rectifier or interrupter G.

Fig. 3 shows an other form of construction in which the condenser C is not parallel but in series to the source of voltage and to the motor M. R is a regulating resistance for speed regulation of the auxiliary motor MH. D*r* is, same as in Fig. 1, a choke, which may be provided; the other reference characters correspond in this instance, same as in other figs., to those of the Fig. 1.

Fig. 4 shows an other embodiment of the invention, in which the opening- and closing-times can be altered by adjusting of the brushes.

Fig. 5 shows an embodiment, in which the regulated motor itself is used for driving the regulating device. W is a parallel resistance.

Fig. 6 shows an arrangement similar to Fig. 5 in which, however, the interrupter G is subdivided into three parallel part-interrupters G_1, G_2, and G_3.

Fig. 7 shows in detail one of the interrupter discs G of Fig. 6.

Fig. 8 shows an other form of construction of the interrupter G with stationary segment body and circulating brushes.

Fig. 9 shows a practical form of the brushes A and B.

Fig. 10 shows the employment of rolling contact rollers A_1 and B_1 instead of the brushes A and B.

Fig. 11 shows an other construction of a contact roller A_2.

Fig. 12 shows a form of construction, in which by a saturated choke D_2 an improvement of the reversal of current is obtained.

Fig. 13 shows a diagram of the current in the alternating current circuit of Fig. 12.

Figs. 14 to 18 show arrangements of polarizing cells P*o* instead of the saturated choke Dr_2 of Fig. 12. In the Figs. 14, 15 and 16 resistances are connected in parallel to the cells P*o*.

In Fig. 17 the cell P*o* is switched in by biasing contacts V_1 and V_2.

In Fig. 18 the biasing-contacts V_3 and V_4 are provided on a brush A.

In Fig. 19 chokes are connected by biasing contacts.

In Fig. 20 shows a connection with an oscillating circuit I and an inductivity L for the further suppression of disturbances by harmonic oscillations and other disturbing oscillations. L*a* is any useful load.

Fig. 21 shows a diagram of a regulator with a quenching-choke Dr_2.

Fig. 22 shows an arrangement according to Fig. 19, however with rotating commutator G.

Fig. 23 shows the utilization of a gas- or vapour discharging tube T*y* for the reversal of current.

Fig. 24 shows the connection of gas-or vapour discharging tubes Ty_1 and Ty_2 with biasing contacts V_1 and V_2 in a regulating arrangement similar to that of Fig. 1, whereas Fig. 25 shows

the employment of the same means in an ordinary mechanical rectifier.

The operation of the arrangement will be first explained with reference to Fig. 1.

C is a condenser, which is alternately to be charged by any sort of switching device immaterial for the type of the arrangement from a source of current designated by ± and discharged into any useful load, which in Fig. 1 is shown as a motor M.

The electric energy transferred to the motor M depends evidently, at given characteristics of the connection, on the frequency at which the commutator G is moved to and from between the two contacts A and B.

If for the simple commutator G any other regulatable switching means, for instance controlled discharging vessels, are substituted or if additional building elements are employed, a regulation can be attained as well by variations of amplitudes or phases.

A regulation can also take place by variations of the value of C.

If necessary in special cases, a choke D*r* and a filter condenser C_2 can be still provided. The variation of frequency can be carried through in an especially simple manner, as shown in a regulating device destined for instance for an over-head line buss as shown in Fig. 2. The over-head wire voltage is fed to the terminals plus-minus. G is a rotating commutator equipped with insulating segments on which slide two brushes A and B so that always alternatingly one of the two brushes comes into contact with a conductive tooth of the body of G.

One pole of the condenser C lies on the body of G. It is supposed, that the body of G has a diameter of approximately 50 mm, 30 conducting respectively insulating segments can be easily accomodated on the circumference. At 6000 revolutions per minute 3000 chargings and dischargings per second result. If the capacity of the condenser is selected at 20 microfarad, already about 40 kw can be transmitted in this manner by the condenser C, which may consist only of five of the usual cup-shaped paper blocks at the usual overhead voltage of about 400 volts at the frequency of 3000 periods. The rectifier G is driven by a friction wheel F*r*, which runs on a calote-shaped disc S*ch* driven by the auxiliary motor MH, as shown in Fig. 2. By the hand lever or a pedal H, MH can be tilted about an axle W, whereby according to the diameter of S*ch*, on which F*r* just runs, the revolving speed of G can be altered practically from 0 up to a maximum value of about 5 to 10,000 revolutions per minute. As the energy given up to the motor M depends on the charging and discharging frequency of C, it can be regulated stepless from 0 to a maximum value without losses worth mentioning occurring in a series-resistance. The expenditure of the regulating arrangement is then low, as MH consumes only so much power as to overcome the friction-resistance of the brushes A, B.

As current of the trolley-wire direct current as well as alternating current can be employed.

Fig. 3 shows an other embodiment of the invention, in which the condenser C is not parallel to the trolley-wire voltage but in series to the source of voltage and to the driven motor M, or to an other useful consumer. The rotating rectifier G is in this instance disc-shaped and consists of two conducting elements which are separated the one from the other by a maeander shaped insulating layer. The two conducting disc parts of the rectifier are connected to the condenser C through slip rings or the like. This condenser may, if desired, circulate itself with G for economizing the slip rings, this being technically possible owing to the relatively small dimensions of the condenser especially if for instance an electrolyte-condenser is employed.

Such a condenser for instance 400 volts has at a capacity of about 20 microfarad only a diameter of about 50 mm at a length of 150 mm. It can therefore easily circulate without making the whole apparatus clumsy. If here it is reckoned again with a number of revolutions of 100 per second equal to 6000 per minute and if each half of the disc-shaped interrupter has 20 conducting segments, an interrupter frequency of 2000 cycles per second results. At 2000 cycles a condenser of this capacity has a current passage of approximately 100 amp. and therefore corresponds to a passing energy of approximately 40 kw, which can be regulated practically without loss by the regulation of the number of revolutions of G.

As in all other cases, also in this instance, one or several chokes D*r* can be provided, which, besides the above described effects, may also have the effect that by turning to one or several predetermined frequencies or frequency-bands, especially at the maximum frequency the capacitive resistance of C is absolutely compensated by turning, so that the consumer M then lies on the voltage source practically without a series-connected impedance.

If, as indicated in Fig. 4, the closing- and opening-times can be altered on the rectifier G, which in this instance can be done by shifting one or both brushes in the direction of rotation of the rectifier, whereby the phase position of the brushes the one relative to the other or to the rectifier can be altered, a regulation can be effected also through this phase alteration.

In this instance it is advisable to make the width of the insulating segments in the direction of rotation greater than that of the conducting segments. As indicated by the arrow on the resistance R in Fig. 3, the speed regulation can also be effected electrically on the auxiliary motor. If, instead of direct current, alternating current is used as operation current, the arrangement has to be altered accordingly by addition of further brushes or segments, when multi-phase current is employed if is adviceable in this case to work with still higher frequencies in order to be able to dimension the filtering means which might be necessary, so that they have a very high resistance for the alternating current of 50 periods or of other low periodicity but well to shunt the high frequency.

It is, however, not at all necessary, to use a special driving arrangement for the actuation of a mechanical or controlled valve rectifier or of any other rectifier, but an arrangement regulated by the object of the invention, for instance a machine whose speed is regulated may itself serve for actuating the rectifier device.

This may be effected, if switching apparatus after the manner of a mechanical rectifier are again employed, which is preferably intended, by mounting a collector like rectifier directly on the axle of a motor to be regulated.

But also other kinds of rectifiers for instance controlled rectifiers, such as valve-rectifiers with and without gas or vapour filling, metal- recti-

fler-like constructions and similar devices are not excluded.

A simple embodiment of this form of the invention is illustrated in Fig. 5.

In this instance a motor M is shown, to which electric energy is supplied from a direct- or alternating-current line.

If G is, for instance, a mechanical rectifier of any type, and if direct current is in question, no energy at all will be supplied to the motor if the motor is at standstill, whereas at alternating current only a very limited energy will reach the terminals of the motor, since the capacitive resistance of the condenser connected to rectifier G is high for the usual low frequencies.

If, however, by a bridging resistance W care is taken, that so much energy is supplied to the motor that it begins to rotate if for instance, alternating current is employed by suitable dimensioning of the condenser in the rectifier circuit a resistance W may be eliminated, then a periodical charging and discharging of the condenser C in the rectifier circuit begins and thereby an additional admission of current parallel to the resistance W.

This additional flow of current allows of a further acceleration of the motor, this resulting again in a further increase of current and so forth.

In this manner, the number of revolutions of the motor increases continually, until owing to an equilibrium state between the energy delivered to the motor on the one hand and consumed energy of a connected machine on the other hand a final state has occurred.

Such a motor has therefore essentially a main current motor characteristic, as, if no other means are provided, it would at first have the tendency to race.

Everywhere, where otherwise series-wound motors can be employed, the motor with the above described regulating arrangement can be used, an automatic starting device thereby being constituted, which prevents excess currents when the motor runs slowly.

If the field winding of the motor is not laid in series to the rectifier G, but for instance parallel, so that only the armature winding or a winding having a corresponding effect (for instance with various alternating current motors) is located in this circuit, the danger of the racing is already thoroughly avoided.

By inserting of the rectifier circuit into the armature winding alone, into the field winding alone, into a compound winding alone or into several such windings simultaneously a number of useful effects can be obtained.

Other regulating effects can be obtained by making the capacity C in the rectifier circuit freely variable, by employing a rectifier G for instance in disc shape, which has different numbers of segments increasing from an inner diameter to an outer diameter and by making the brushes radially displacable whereby said brushes can be brought into contact with different segment numbers per revolution, so that in this manner in the rectifier circuit different frequencies at given number of revolutions can be obtained.

This makes possible a further means of regulation which may be practically combined with that which is above described.

Finally additional self-inductances D may be contained in the condenser circuit, which also may be rendered variable.

With such an arrangement a well defined maximum number of revolutions can be adjusted which the motor does not exceed.

If the number of revolutions of the motor multiplied by the employed number of segments approaches a value which corresponds to the natural frequency of the resonance circuit C and D a maximum of electrical energy is supplied to the terminals of the motor.

If the number of revolutions tends to exceed this value, the impedance of C, D increases considerably and the speed of the motor adjusts itself to a value which deviates only slightly from the resonance condition.

Also in this instance an additional regulation can be attained by varying any of the said components (segment-number, inductivity or capacity).

Besides the different standard motor types such as series connection, shunt connection and compounding and their modifications can be utilized.

Also in this instance all the above mentioned possibilities are applicable.

The condenser C and the choke Dr can therefore either rotate with the rectifier or can be carried out as stationary elements by employing slip rings and brushes, as indicated in dotted lines.

In the above described embodiments the alternating current forming the intermediate element of the transformation, especially medium- or high-frequent alternating current is produced by periodic charging and discharging of condensers.

Although in a circuit which has essentially a capacitive characteristic or has even attained an ohmic characteristic by the process of turning intensive interruption sparks are to be feared, the sparks at make can become disagreeable at great energies.

If one operates with very great energies and relatively high voltages, it is possible that very strong currents develop through the closing sparks at the closing of the condenser circuit, which might give rise to disturbances.

To avoid this, it is advisable to subdivide the capacity into individual part-capacities or subdivide at least the closing current into part-currents, which can be attained by the employment of brushes, for instance carbon brushes, which are subdivided in their longitudinal axis.

By this process an approximately uniform distribution of current between the individual brush parts or the individual independent brushes can be obtained.

If instead of the collector-like rectifiers pendulum or non-mechanic rectifiers are employed, such as controlled gas- or vapour-rectifiers or other kinds of rectifiers, one has to proceed accordingly.

As already mentioned, it is also advisable, to subdivide into several parallel condensers.

This instance is diagrammatically illustrated in Fig. 6, MH being the auxiliary motor, the revolving speed of which can be altered as desired with the control-resistance R, whereas G_1, G_2 and G_3 represent the rectifiers or interrupter discs with built-in condensers.

The connection of such a rectifier disc with built-in condenser is diagrammatically shown in Fig. 7, A and B representing, same as in Fig. 6, the current supply and discharging brushes.

It may be advisable, to provide one condenser C_2, at the admission brush and at the discharge brush, said condensers being shown in Fig. 6 in

dotted lines, this being useful not only for a device using the subdivision of the current path here described but also in all other instances. By this subdivision, in the case of Fig. 6, in three parallel condenser branches, it is attained, that in every individual branch the energy may be kept below that amount, at which the charging current for the condenser can assume in the closing spark values which at permanent service would have disagreeable consequences.

Besides this purely technical advantages of the subdivision a further advantage from the point of manufacture results.

As shown in Fig. 6, already very remarkable energies can be regulated by one single interrupter-disc-condenser element, these energies being sufficient for many purposes of the technics. It is now possible with only quite a few constructional elements to manufacture and put together regulators of very different energy handling power.

To this end it is necessary to produce different regulating elements only for very materially differing voltage values and then to put a greater or smaller number of such elements onto the axle of a regulator according to the desired power handling capacity of such an installation.

Under circumstances even a single type of interrupter element or only one range of such element would be sufficient, in which case higher voltages can be obtained by series connecting several regulators mounted on an axle, whereas higher energies can be attained by parallel connections and high energies at high voltages by group-connection of similar elements.

It is evidently not absolutely necessary, but advisable owing to the cooling, to build the condensers into the rotating rectifier disc, but it is also possible to arrange the rotating rectifiers merely as reversing- or recharging devices and to make the condensers stationary.

Also in this instance it is not necessary to employ a rotating segment disc as shown in Fig. 7, as it is possible to use a set of brushes, to which current is fed by slip rings, within a stationary ring of segments, a shown in Fig. 8.

In this figure the individual condensers are further not all simultaneously charged and discharged, but the charging and discharging periods of the individual condensers mutually overlap, so that as an intermediate element of the transformation multi-phased alternating currents are produced which are mutually phase-displaced.

As indicated in Fig. 7 by dotted lines, it is possible to connect a self-induction in series to the rotating condenser (evidently also a stationary condenser might be used) this self-induction producing at a number of revolutions of the auxiliary motor preferably used in service, for instance at the maximum number of revolutions resonance for the condenser charging currents, so that at this number of revolutions the regulator practically represents no resistance worth mentioning (besides the small ohmic resistances) it then represents a closed switch for the load circuit connected to the regulator.

Instead of the series connection of a inductance to the charging condenser a parallel inductance may be employed as well in subdivided as also in non-subdivided charging current paths, which parallel inductance represents at a predetermined, preferably low number of revolutions of the auxiliary motor together with the condenser a rejector circuit for the charging frequency, so that the regulator at this number of revolutions acts as an open switch for load circuit.

The employment of series- and parallel inductances may be combined also for the obtention of both effects at different numbers of revolutions of the auxiliary motor.

In the circuits, in which the intermediary alternating currents of preferably medium or high frequency become effective, multi-stage filters or chain conductors of any possible known construction and characteristics, may be arranged, which then permit of producing special effects corresponding to these filter characteristics.

If, for instance, such filter-like structures with several different resonance ranges are employed, it can be ascertained, especially in arrangements in which the number of revolutions of the rotating interrupters or rectifiers is in the pre-determined relation to the number of revolutions of any working- or driving engine, that this driving engine then possesses different stable numbers of revolutions corresponding to these resonance ranges.

This holds especially true for plants shown in the accompanying drawings.

Besides the regulation by alteration of the number of revolutions a regulation can also be otbained, in all arrangements mentioned here and in the other embodiments, by varying the magnitude of the charging capacity or the magnitude of an inductance combined with it during operation.

Frequency alterations by alteration of the number of breaks and alteration of capacity or self-inductance, or both, in the charging circuit may be combined.

In Figs. 7 and 8 it has been shown, that it is practical to equip the brushes sliding on a rotating interrupter with inclined end faces.

The object of this measure is the following:

It is known, that especially in pressure contacts which open relatively slowly, or which are opened only to a little contact distance, owing to the shorter de-ionising time, the quenching action is better than in contacts, which are moved asunder to a greater distance, as is the case in ordinary lever-switches.

For this reason pure pressure-contact switches have frequently been preferred to rotating switches.

On the other hand, the rotating switch possesses the advantage of the uniform movement which is advantageous for different reasons, especially then, if different closing-and opening-periods and closing- and opening frequencies of the switch are desirable.

The different switch frequency can then be attained simply by alteration of the number of revolutions of the rotating segment wheel, whereas closing- and opening-times are altered by axial displacement of the brushes and the use of segments constituting no axle parallels on the mantle line of the cylinder of the segment wheel, but having limiting lines inclined relative to the axis, so that segments are produced which are more or less trapezoidal.

By making the brushes resting on the rotating interrupter of pointed shape and chosing preferably an obtuse pointing angle as shown in Fig. 9, a break effect is obtained with rotating interrupters similar to that of pure pressure contacts. At first the separation between the contact faces takes place only at a little distance,

as an interrupter segment moves along the bevelled face of the brush body.

Such arrangements, however, wear more rapidly than pure pressure contacts, which are fixed on springs or contact fingers.

This inconvenience can, however, be avoided by an arrangement as shown in Fig. 10, in which the brushes, which possesses a sliding friction on the circumference of the segment body moved relatively to them, are replaced by rollers or discs which roll on the moved segment body.

If the disc as well as the segments are made of particularly well conducting material, such as copper, brass, silver, tungsten and the like, or if at least one of the two materials destined to make contact with the other consists of such substances, arrangements are obtained, which work with uniform movements, in opposition to contact fingers controlled by cams or the like, and still possess the same property of negligible wear and the same little opening distance as switch mechanisms equipped with contact-fingers or contact springs.

By the rotation of the discs always fresh cooled metal faces are further used for contact making. If in such an arrangement the separation of the contacts takes place too slowly, this can be obviated providing incisions in the metal disc replacing a brush, said incisions corresponding as regards position to the layers of insulating material separating the individual interrupter segments.

It is then, however, advisable to ensure by the use of gears or the like that the radial incisions in the current taking disc always encounter the correct spots on the interrupter wheel surface.

In Fig. 10 this arrangement is shown on a device which otherwise corresponds in principle to the arrangement shown in Fig. 5.

Fig. 11 shows an other embodiment of this inventive idea, in which between the segment wheel proper and the current taking roller a ring of silver or similar material is located, which dips into a vessel containing alcohol.

Also in this instance the silver ring, as above mentioned, may have a radial incision.

Only one single current taking roller is shown for the sake of simplicity.

The hydrogen atmosphere which is then produced at the contact point, said point being preferably encased, still improves the quenching capability.

These arrangements are to be used especially in the shown embodiments of the present invention, but they may generally be employed in all cases, in which by suitable measure care has been taken, that the current interruption or current closing takes place in a moment, in which the voltage or curernt intensity has decreased to values, at which heavy arcing has not be feared.

These arrangements have therefore expressed in other words to be employed, where one has so far made use of pressure contacts and small switch openings for the obtention of a good quenching effect.

How the demand for a limitation of current or voltage at the moment of the closing or opening of the current can be fulfilled shall be explained in embodiments of the invention, which will be hereafter described, and whereby contacts employed may either be of the pressure-contacts type with short opening path or contacts according to the above mentioned figures.

But all other kinds of contacts, especially such as correspond to the said requirements, might be employed from case to case.

Fig. 12 shows an arrangement, in which by a saturable choke coil Dr_2, which is inserted in the circuit of the periodic commutator, it is attained that, when passing through the zero-line by the then not existing saturation in the choke coil, containing ferro-magnetic material, steps are produced in the alternating current curve, as indicated in Fig. 13.

By these steps with little values of current intensity it is attained, that no objectionable discharges on the contacts are produced even if slight displacement between the switching moments and current zero points are present, since the current intensity or voltage during the switching proceedings is held in any case below the critical limit-value, at which stronger discharges might occur.

Instead of mounting the magnetising-winding directly on the choke itself, the magnetising winding of the choke may also be mounted on a separate magnet, according to my U. S. A. Patent application Ser. No. 749,088, whereas the choke iron proper, which consists preferably of nickel-iron alloys or other alloys with sharply pronounced saturation bend and little coercive force, can be arranged in form of band-wire or also iron powder cores between the poles of these magnets, similar as a Gramme annular armature between the magnet poles of a dynamo engine.

The winding of this "annular armature" acts then as saturated choke, which itself may cooperate at least partly in building up of the saturating magnetic field.

This arrangement presents the advantage, that also iron powder cores or cores may be employed, which owing to the great distance between the individual very thin wire bands of the core possesses such a small permeability, that they could not be saturated by an applied winding alone.

By such an additional natural- or electromagnet it is also possible to obtain, compared with the above described alternating current magnetic bias, a direct current magnetic bias, which is sometimes required, for instance, if for removing the effect of the coercive force of the choke an auxiliary direct current- or alternating current bias magnetization is required.

Instead of a quenching choke as shown in Fig. 12 or 13, a polarisation cell, a gas discharging vessel, a locking layer cell of the metal rectifier type (or several series connected ones if necessary) or other similar elements might be used, which permit of a determined threshold-limit voltage or other counter voltage.

Also electrolyte condensers and electrolyte rectifiers can be employed in this instance.

How such cells can be connected is shown in the Figs. 14 to 18. in which said components are symbolised by a circle with two parallel lines indicating the electrodes.

In the Figs. 14, 15 and 16, which represent the switching elements of an arrangement, as shown for instance in Fig. 12, ohmic resistances, self-inductions or the like, which if desired may be saturable, are connected in parallel to said cells.

The parallel resistance or the parallel inductivity or the like to the polarization cell is so dimensioned that the energy stored up in this polarization cell or locking layer rectifier cell, on which the counter voltage builds up at first, with rising values of current of the semi-wave of an alternating current, has approximately been dissipated in said resistance, when the current

reaches its minimum value at the end of the same half period.

If the counter voltage would remain unaltered, that is, if said polarization cell or the like was a constant source of current, the voltage of which might, for instance, amount to 5 volts, the zero-line in the diagram of the considered alternating current would be simply lifted by these 5 volts.

As, however, the voltage of the polarization cell in consideration is not constant, but discharges itself also to zero during the fraction of a period during which the current or voltage curve approaches the zero values, a step is produced in this current or voltage curve by the action of this cell, similar to that shown in Fig. 13.

For the improvement of this effect a rectifier of suitable polarity may be connected in the discharging circuit of this cell if desired, as shown in Fig. 14 in dotted lines.

Fig. 15 corresponds as regards its effect and in general to Fig. 14, with the difference that here a choke is shown instead of a leak resistance.

In Fig. 16 the cell with choke is laid in the middle branch of the pendulum interrupter.

In Fig. 17 the arrangement is such, that the pendulum interrupter first encounters, at the oscillation towards the right or towards the left, an auxiliary contact, which in turn is only then conducted by the pendulum interrupter against the main contact.

By the auxiliary contact the current is first sent through the polarization cell, rectifier cell or the like producing a counter voltage, which is then short-circuited in the further course.

Hereby a kind of step is again produced in the alternating current curve, whereby the time is lengthened again, during which for the switching proceedings harmlessly low voltages or currents exist.

In Fig. 18 an arrangement similar to Fig. 17 is shown in which, however, a rotating segment wheel is used instead of the vibrating reed interrupter.

In order to here attain a similar effect as in Fig. 17, smaller auxiliary brushes are mounted adjacent to the main brush in both directions at small distance, which first come into touch with the next following segment or leave last the segment over which the main brush has just passed.

Instead of the brushes shown here for simplicity's sake, at least the main brush may be constructed as set forth in Figs. 9, 10 and 11 and the corresponding parts of this description.

In order to avoid a too sudden rise of current in the polarization cells, rectifier cells, gas- and vapor discharging vessels or the like, limiting resistances or chokes, if desired saturated chokes, may be provided as indicated in dotted lines in Figs. 17 and 18.

Besides in all arrangements described there may be provided separate quenching condensers as indicated in dotted lines in Fig. 5.

Fig. 19 shows an arrangement, in which instead of the cells described, merely a choke, if desired saturated, is employed.

Fig. 20 shows an arrangement for current regulation (according to the principle of Fig. 10) in which disturbances occasionally caused by sparks from harmonic waves and other disturbing oscillations, which do not harmonize with the periodicity to which the arrangement is matched, are avoided by inserting electric filters into at least one of the feeding wires to the brushes said filters offering a high admittance for the desired frequencies but suppressing others.

In Fig. 20 for instance there is produced a series resonance member by selfinduction L and by the tuned circuit I comprising a selfinduction and parallel-connected capacity and possessing a capacitive characteristic for the desired frequency, which member passes unweakened the desired frequency, whereas the oscillatory circuit L alone may be constructed as rejector circuit for the chiefly disturbing frequency, for instance for a harmonic wave.

The desired frequency may be in this instance the frequency which occurs at the most frequently used number of revolutions of the rotating interrupter U.

The choke Dr serves amongst other purposes for the suppression of fluctuations in the supplied circuit.

As in any of the embodiments delt with the arrangement shown in Fig. 20 may be suitable combined with every other arrangement that has been described or mentioned in the present application.

Any of the quenching- or switching arrangements may be used therefor in this connection, as for instance saturated quenching chokes or the like, which may be effected by properly choosing the values of the inductivities L, Dr or J.

Or a contact construction as shown in Fig. 18 may be employed, or both the last mentioned or other forms of constructions may be combined with each other.

The use of a saturated quenching choke as shown in Fig. 12 in an arrangement which otherwise may substantially correspond to Fig. 10 and which may serve for instance to regulate the current in a load circuit by changes of the interrupter frequency is shown in Fig. 21, the saturated choke being designated by Dr_2.

An arrangement which corresponds to the principle of Figs. 12 or 22 respectively, but comprises a controlled preferably gas filled discharge tube Ty for lengthening the duration of the changing over or switching period is shown in Fig. 23.

In this embodiment the sparking which may occur when making a contact in a capacitive circuit and therefore also in an arrangement according to Fig. 21 and which might produce an objectionably high current intensity and consequent contact wear before the contacts have already come into touch when approaching each other, has been avoided or reduced by a controlled gas-discharge tube with incandescent cathode inserted between a main contact and an auxiliary contact.

The grid of the tube is connected to the cathode by a high ohmic protective resistance and a biasing battery or an other biasing source so that a blocking negative voltage exists on the grid and the valve is not conducting.

If the switching reed touches the auxiliary contact, the blocking of the valve is suppressed by short circuiting the grid voltage and the making of contact then takes place by means of the tube.

As the tube prior to the contact of the reed with the auxiliary contact is non-conducting, no pre-discharging can take place between reed and auxiliary contact.

The grid voltage is so small or the protective resistance which is series-connected to the source of grid voltage is so high, that either the voltage or the current intensity remains so small, that

by this discharge no contact-damaging can be caused.

As at the further movement of the switch reed the auxiliary contact is connected with the main contact, the arrangement possesses the advantage associated with the use of controlled gas-discharge vessels, since switching sparks between metallic contacts are avoided, whereas, on the other hand, as the gas discharge tube is short-circuited shortly afterwards as already stated, the voltage drops generally experienced when using gas discharge tubes does not exist during the greater part of a half period so that the efficiency is improved.

As the gas- or vapour discharge tube is in function only during quite a short time within one period, it may be built for small values of energy dissipation only and will therefore be small and light even when employed for the switching of great amounts of electrical energy.

In order to ensure rapid ionising- or de-ionising periods especially at high frequencies, it may be advisable to use gas- fillings with small atomic weight in the discharge vessel such as hydrogen or the like.

As in all other arrangements described in the present application, also in this instance quenching condensers may be used, as has again been indicated by dotted lines.

Fig. 24 shows an other arrangement of this kind, which is easy to understand without further explanation.

Fig. 25 finally shows an ordinary rectifier, in which a mechanical main rectifier is combined with an auxiliary rectifier for taking over the making or breaking periods.

When the pendulum moves to the left, it first encounters the left hand auxiliary contact connected to the left grid, short circuits the grid biasing voltage and makes thereby the switching-in shock pass through the tube.

A short time after this the tube is short-circuited and the main part of the current of the corresponding half-wave flows through the main contacts of the mechanical switch.

At the opening first the left hand main contact is opened, so that then the tube takes over the flow of current thereafter the biasing voltage is applied to the tube, so that it interrupts the flow of current shortly afterwards when the voltage passes through the zero-value.

The same proceeding repeats itself at the right hand side phase.

La designates the load circuit in the Figs. 24 and 25.

Quite at the top in Fig. 25 the primary alternating current connection of the rectifier is shown.

In order to avoid undesired formation of harmonics by switching-over from the discharge vessels to the main contacts, filters or filtering means may be employed in the respective circuits for smoothing sharp edges in the current curves.

As the voltage drop within the discharge vessels is only in the order of about 10 volts, the main contacts have to switch at the utmost voltages, which mostly lie under the critical values, so that currents of any desired magnitude can be switched.

If for any reasons higher voltage drops shall have to be dealt with in the discharge tubes, or if for any reasons the voltages at the contacts have to be lower, it is possible either to use subdivision of the switch voltage between several series-connected contacts, or an auxiliary direct voltage may employed in the circuit of the discharge vessel, so that this auxiliary voltage supplies part of the voltage drop in the discharging vessel, for instance by switching in of some accumulator cells into the cathode- or anode-leads, so that only the difference between this auxiliary voltage and the total voltage drop of the discharging vessel then occurs on the switching contacts.

If in the above described or mentioned embodiments of the present invention only single phase alternating currents have been considered, this has been done for simplicity's sake; the disclosures are, however, also applicable for the employment of polyphase currents, in which instance a number of the switches and discharge vessels required may suitable be combined into polyphase suits.

The described spark- quenching- or other safeguarding arrangement for switches are not limited for the use in periodical operating switches, but may also be employed with advantage in relay-contacts or the like, although their advantages in these instances do not always prevail at full extent.

LADISLAUS DE KRAMOLIN.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

L. DE KRAMOLIN

REGULATING ARRANGEMENT

Filed June 18, 1941

Serial No.
398,549
3 Sheets-Sheet 1

Fig. 1

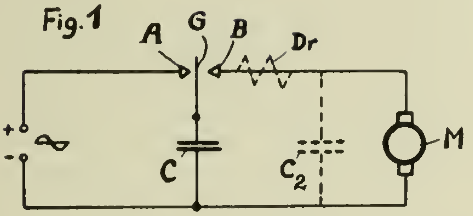

Fig. 6

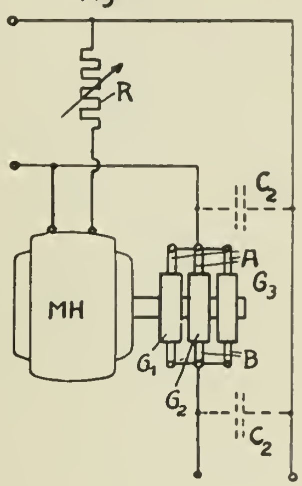

Fig. 2

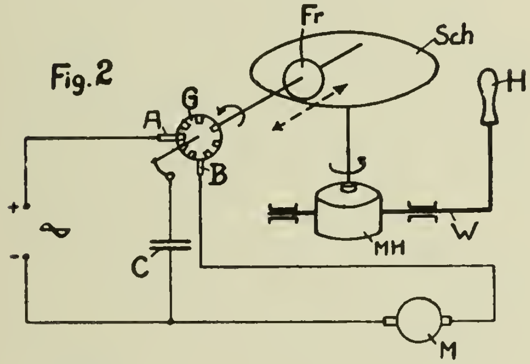

Fig. 3

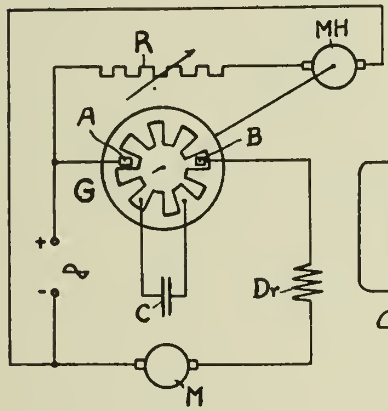

Fig. 5

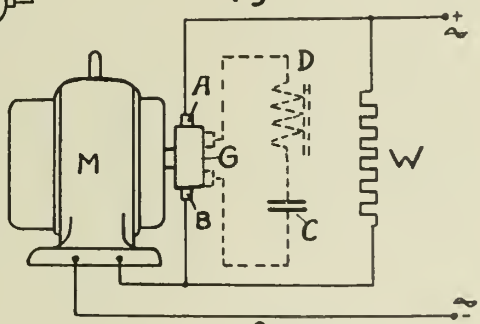

Fig. 4

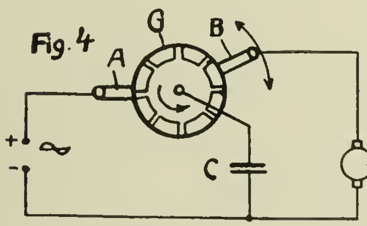

Fig. 7

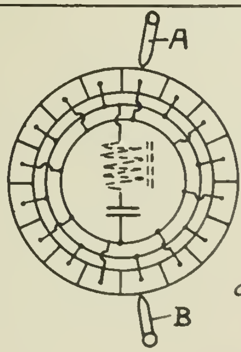

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Fig. 8

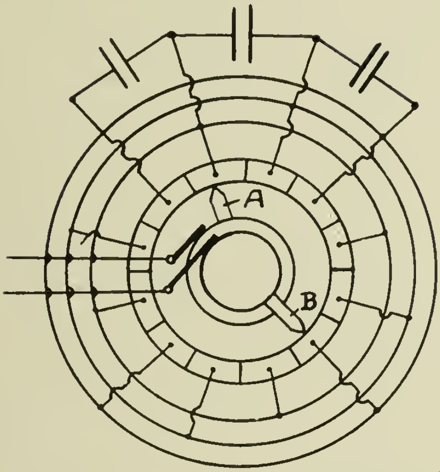


Fig. 12

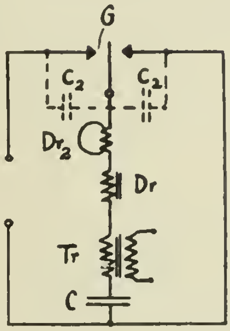


Fig. 9

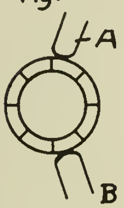


Fig. 10

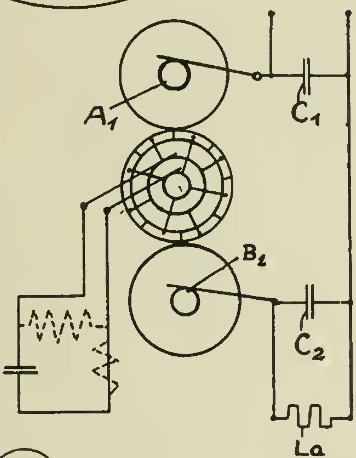


Fig. 13

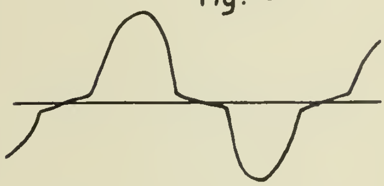


Fig. 14

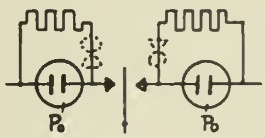


Fig. 11

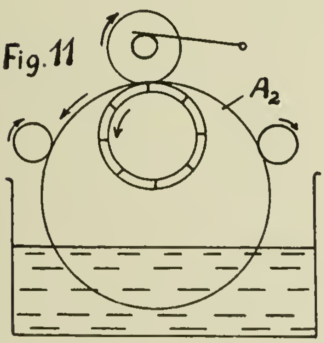


Fig. 15

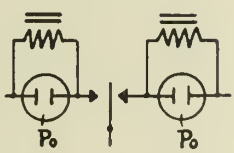


Fig. 16

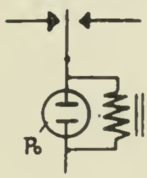
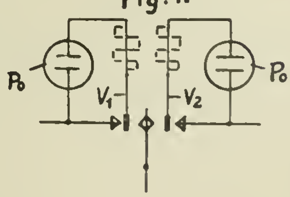


Fig. 17



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BY A. P. C.	Filed June 18, 1941	3 Sheets-Sheet 3

Fig. 18

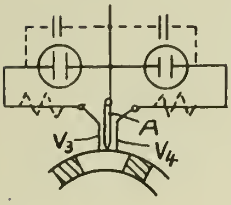


Fig. 19

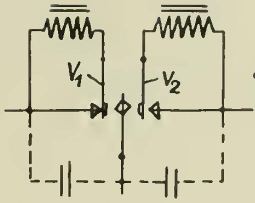


Fig. 20

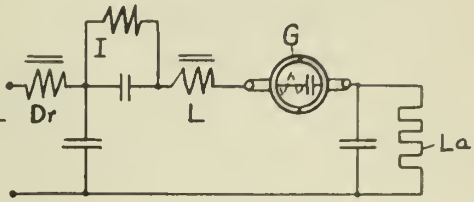


Fig. 21

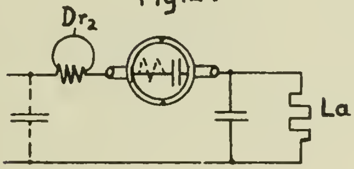


Fig. 22

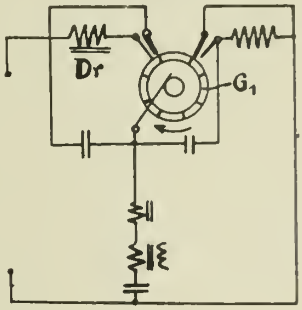


Fig. 23

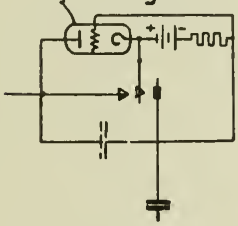


Fig. 24

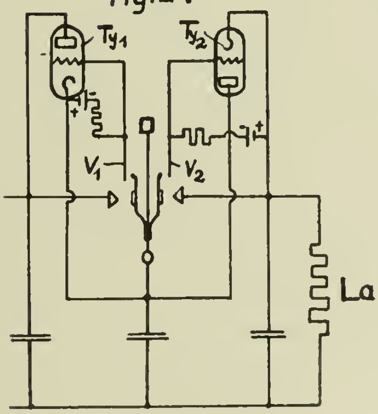
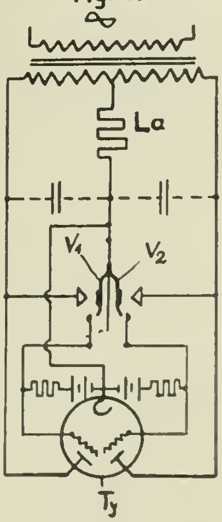


Fig. 25



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ALIEN PROPERTY CUSTODIAN

JOINTS FOR CABLES FOR HIGH TENSION WITH OIL INSULATION

Cornelis Frederik Proos, The Hague, Netherlands; vested in the Alien Property Custodian

Application filed June 20, 1941

This invention relates to joints for cables for high tension with oil insulation.

When manufacturing cables for high tension with oil insulation special attention is to be paid to the circulation of the oil between the place of maximum intensity of the field and the oil container connected with the cable. These oil containers supply oil under pressure into the cable at decreasing temperature and suck it in again at increasing temperatures of the cable.

For cables provided with a canal located under the lead cover the supply of oil from outside does not give rise to difficulties. If it is preferred to provide also these cables with a central canal in the conductor and to supply the oil directly to said central canal, this supply of oil will have to be effectuated in the cable joints. In that case the insulating layers in the joints will have to be provided with canals enabling the flowing of oil into the conductor. It is already known to provide the connecting clamp in the joint with radial canals; for this purpose the clamp is given a special shape, whilst also the insulation surrounding the clamp is made in a special way. The insulation surrounding this clamp is exposed to a high dielectric load; in order to obtain that the value of the insulation be as high as possible, it will have to be manufactured with as simple a shape as possible. If anyhow possible each complication in the shape of the taping will have to be avoided, in other words its shape should be as simple as possible.

When applying the invention the clamp will be of quite normal construction and in view of the high tension it should preferably be outside entirely closed and of cylindrical shape; the diameter preferably is as great as that of the conductor connected therewith. It may occur however that the special construction of the conductor requires a different shape; nevertheless radial canals in the connecting clamp are avoided.

When applying the invention the advantage is obtained that the canals in the insulating tape are only located on places of relatively low field intensity; this field intensity is, as it is known, smaller in proportion to the distance from the conductor. The local increase of the diameter of the conductor according to the invention may be constituted by a jacket of conducting material and having a perforated surface (e. g. wire netting or perforated plate) surrounding the conductor, the insulating material being wound on said jacket.

In cases wherein the connecting clamp of the joint constitutes a separation between inner spaces in the joint, when applying the invention the advantage may be obtained that in service the manufacturing lengths or groups of manufacturing lengths of the cable may be kept entirely separated. For this purpose according to the invention in the middle of the joint an annular partition may be provided, extending from the wall of the joint to the outer surface of the insulating tape; in this way the oil space surrounding the insulation layer will be divided into two parts. A complete independency of the manufacturing lengths of the cable is insured, which is especially important with systems in which each manufacturing length is supplied by its own oil container. Also in cases of disturbance this separation of manufacturing lengths is advantageous.

The drawing shows different construction forms of the invention.

Fig. 1 shows a part of a longitudinal section of the joint in which the conductor has two parts of increasing and decreasing diameter.

Fig. 2 is a part of a longitudinal section of a construction form in which the manufacturing lengths of the cable are completely separated.

Fig. 3 shows partly in section a joint according to the invention in which there is a single part of the conductor with increasing and decreasing diameter, located symmetrically with respect to the middle of the joint.

The conductor 1 of the cable has a hollow core. In Fig. 1 the diameter of the connecting clamp 2 corresponds to that of the conductors connected with the clamp. The conducting wires near the ends of each cable at 24 are bent outwardly on a certain distance in order to obtain a spaced entrance for the oil into the central canal of the conductor. The gradual increase of diameter of the outer surface of the conductor is obtained by means of a metal jacket 5, surrounding the conductor. This jacket 5 does take part in the conduction of the current; its principal function is to constitute an aequipotential surface of suitable shape. The jacket 5 is provided with perforations. On the place where the canals emerge in the jacket (in Fig. 1 four canals are provided: two at each side of the connecting clamp, namely 6, 7, 8 and 9) the metal jacket is as open as possible; also the remaining part of the jacket will preferably be provided with apertures.

The canals in the simplest way may be formed by helically wound strips of thick paper or linen or other suitable material, as shown on the drawing. Consequently the conductor of each cable manufacturing length via said helical canals in

the tape insulation is in direct connection with the space outside of the tape windings.

Rings or sleeves 3 are provided in order to obtain that the shape of the conductor in the insulation is maintained when adjusting the joint.

Fig. 2 of the drawing shows a corresponding construction of the connecting clamp for the case, wherein it is desired to wholly separate the cable manufacturing length; in this case the joint is bipartite and comprises in its middle an annular partition 10, which extends from the wall of the joint up to the insulating tape. The inner space in the clamp 2 in this case is entirely divided into wholly separated parts by means of a partition 12.

Fig. 3 shows another construction example of a joint according to the invention. Similar parts are indicated with the same numbers as in Figs. 1 and 2. The space surrounding the connecting clamp 2 may be closed by means of copper wire cloth in the shape as described above. The dotted line indicated in the paper insulation 11 is the helical canal 8 by means of which a communication is obtained between the space surrounding the connecting clamp 2 and the spaces 13 and 18 at both ends of the joint; these spaces 13 and 13 are in communication with the oil containers, located outside the joints, by means of the piping 14.

In the paper insulation outside the helical canal 8 oil tight layers 15 are provided, which prevent leaking of oil in radial direction and in longitudinal direction via the outer surface of the connecting clamp 2 in the middle of the joint. Owing to the provision of these oil tight layers 15 the joint is divided into three separate spaces, containing oil. Each of these spaces may be evacuated separately. The pipe 16 enables after adjusting and filling of the joint to connect space 13 at the left side with the space 17 in the middle of the joint. The space 18 at the right end of the joint remains separated from the remaining part of the joint as at this end of the joint there is no pipe corresponding to pipe 16 at the left end of the joint.

The taping 19 is provided to form a support in the middle of the joint; it is provided with a helical canal 20, which connects the left and the right part of the space 17 in the joint with each other.

A plug 21 is provided for evacuating and filling of the middle part of the joint and at the same time to give access to the end of the pipe 16. There is further provided a pipe 22 for drawing off oil for examination of samples. With 23 a funnel-shaped part is indicated, which controls the electrical field.

CORNELIS FREDERIK PROOS.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

C. F. PROOS
JOINTS FOR CABLES FOR HIGH TENSION
WITH OIL INSULATION
Filed June 20, 1941

Serial No.
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2 Sheets-Sheet 1

FIG. 1

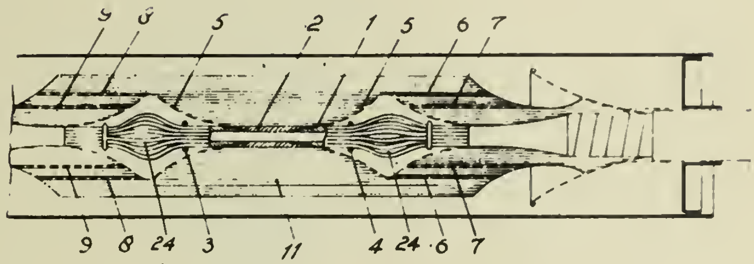
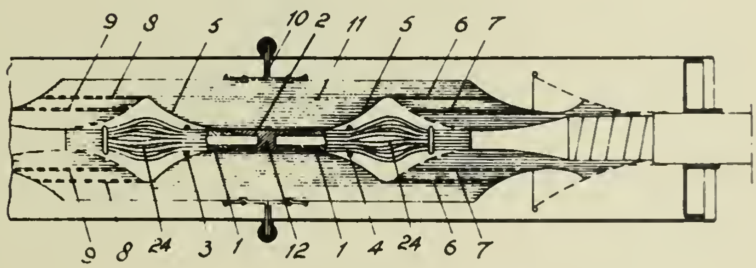


FIG. 2



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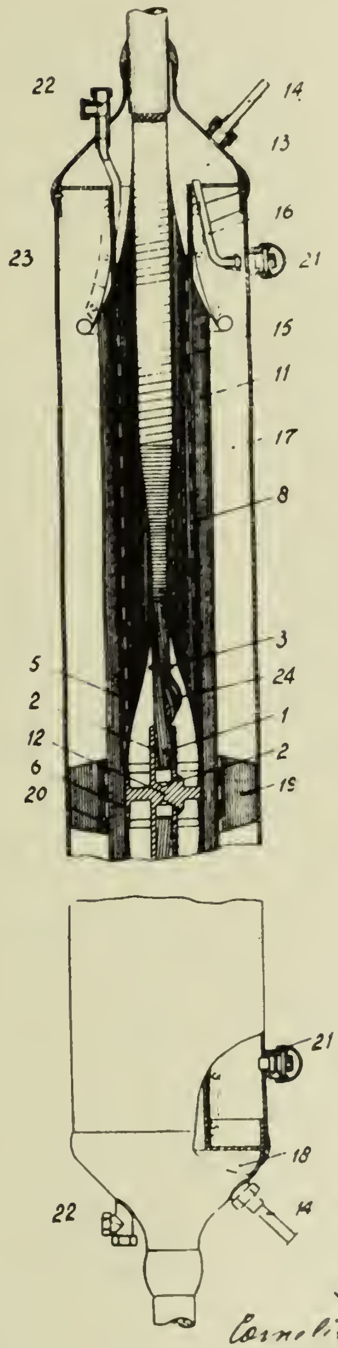
2 Sheets-Sheet 2

FIG. 3



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Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

REFINING MINERAL OIL

Carl Zerbe, Hamburg, Germany; vested in the Alien Property Custodian

No Drawing. Application filed June 24, 1941

This invention relates to a method of refining mineral oil.

In the process of refining mineral oil after the dry refining method by means of sulphuric acid one proceeds generally in such a manner that after acidification of the oil with sulfuric acid the acid constituents contained in the acidified oil are neutralized by means of an excess of dry lime, the neutralized oil then being subjected, without preliminarily separating the lime, to a further purification and bleaching earth. In this procedure, the lime used for neutralizing the acidified oil passes into the decolorizing clay, partly in its original form, and partly in its converted form as lime salt (soap), so that the resulting spent, oil-containing decolorizing clay still contains the total amount of converted lime compounds corresponding to the amount of lime which had been applied.

Now, if it would be attempted to reactivate this used clay after removal of the adhering oil and colorizing substances, it would be found that the decolorizing clay can be reactivated to a reduced decolorizing efficiency only, corresponding to the content of lime compounds, since the lime compounds are inactive and even hamper the decolorizing process. On account of their insolubility the removal of the lime compounds would be so expensive and difficult that reactivation of such lime-containing clays would not offer any advantages.

I have now found that a practically complete reactivation of spent clays can be achieved by treating the oil after its acidification with basically reacting compounds which are adapted to form soluble salts in water or in neutral organic solvents, then treating the oil with decolorizing clay, and treating the spent clay separately with at least two solvents, the first solvent being one which is adapted to dissolve the oil constituents contained in the decolorizing clay and the second solvent or solvents being adapted to dissolve the resinous constituents and the reaction products of the basically reacting compound used as a neutralizing agent.

Suitable organic and basically reacting compounds are, for instance, organic bases, such as, aniline, toluidine, amines, etc., and suitable inorganic, basically reacting compounds are alkalis, carbonates, magnesite and, first of all, ammonia. Ammonia may be used in its gaseous form where it is intended to maintain the principle of dry refining, but a concentrated solution of aqueous ammonia is also suitable.

I have found that compared to lime, ammonia also offers the advantage that the acid constituents contained in the acidified oil from the acidification are decolorized or bleached, so that the spent clay which with lime as a neutralizing agent would be of quite dark colour, shows a light yellow to brown colour where ammonia is used. The refined oil products resulting by neutralizing with ammonia are at least equivalent to those obtained by neutralizing with lime.

The oil contained in the spent decolorizing clay can be completely separated from the clay by extraction with benzene or gasoline, while the resinous constituents can be extracted by a mixture of a neutral solvent, such as benzine (motor sprit) or benzol combined with a polar solvent, such as alcohol, acetone, etc. A very suitable mixture consists of benzine with about 10 percent alcohol. The clay from which the oil thus has been removed, when treated with hot water, will be found to have its original adsorbing efficiency which even after repeated regeneration is not lost.

The process according to the invention can be applied to any kind of decolorizing clay.

In some instances, it may be advantageous, with a view to rendering the clay more suitable for the regeneration, to remove the acid resin as fully as possible after the acidification, and before the neutralization of the oil, by adding substances accelerating the precipitation of the acid resin, such as, lime, water, cement, etc. This causes precipitation of asphalts and resinous substances and permits easy removal from the oil of said substances which without said precipitation and removal therefrom would enter into the clay during the next steps of the treatment. The bases may be used in the form of liquids, but it is also possible to use the same in their gaseous state (for instance, ammonia) or in their solid state (for instance, soda).

Further, I have found that it is advantageous to use a slightly wet clay. The wetting may be effected by the residue of water remaining in the oil from the above mentioned addition of water, or by the water added to the oil or to the clay in any other manner.

Example 1

A heavy distillate of engine oil was acidulated with sulphuric aicd; after mixing, water was added (about 10 percent by weight of the sulphuric acid) and the mixture was stirred and exposed to a gravity settling process.

After the settling the oil was neutralized with ammonia and treated with clay. The spent clay was reactivated by successive treatment with benzine, a benzine alcohol mixture and water. It

will be seen from the table that the clay on being revivified four times in the above described manner still had its original decolorizing efficiency.

Treatment	Neutralisation number	A. S. T. M. colour number			Steam emulsion number
		Immediately after neutralisation and treatment with clay	After 5 hours treatment at 100 C in the presence of iron	Ditto after 10 hours	
4 percent H_2SO_4 (+H_2O) refined NH_3 and 3 per cent clay—					Seconds
With fresh clay	0,03	−2½	+2½	+3	100
With spent clay reactivated four times	0,03	−2½	+2½	+3½	90

In the above table "neutralisation number" is the amount in milligrams of KOH (potassium hydroxide) required for neutralizing the acids (organic and inorganic) contained in 1 gram of oil. The A. S. T. M. colour number relates to the glass colour standards of the A. S. T. M. Union Colorimeter (method 5 b/36, A. S. T. M. D155–34 T.), while the steam emulsion number relates to the A. S. T. M. Steam emulsion test (method 44/36, A. S. T. M. method D157–36).

Example 2

50 tons of a heavy engine oil re-distillate were acidulated with 4 percent sulphuric acid at about 40° C., as usual. After intensive mixing, water was added (10 percent of the amount of sulphuric acid). After short mixing and settling, the deposited acid tar was removed and the oil was neutralized with 0,6 percent by weight of magnesite at 70° C. and decolorized with 3 percent by weight of clay. The spent clay was reactivated as described in Example 1. On refining the heavy engine oil the following results were obtained:

Treatment	Neutralisation number	A. S. T. M. colour number			Steam emulsion number
		Immediately after neutralisation and treatment with clay	After 5 hours treatment at 100° C in the presence of iron	Ditto after 10 hours	
4 per cent H_2SO_4 (+H_2O) neutralised with magnesite and decolorized with 3 per cent clay—					Seconds
With fresh clay	0,03	−2½	+2½	+3	100
With spent clay reactivated four times	0,03	−2½	+2½	+3½	90

The method of the present invention has been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described.

CARL ZERBE.

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ALIEN PROPERTY CUSTODIAN

ELECTRIC INSULATOR

Hendricus Johannes Lemmens and Eduard Gerardus Dorgelo, Eindhoven, Holland; vested in the Alien Property Custodian

No Drawing. Application filed July 2, 1941

The object of this invention is to improve the electrical insulation of glass, for which purpose according to the invention gas is dispersed in the glass.

The use of glass in which gas is dispersed has previously been suggested for the insulation of sound and heat, as well as for rendering objects, such as advertising letters, luminescent by gaseous discharges.

The present invention is based on recognition of the fact that by means of a limited quantity of gas dispersed in glass, provided that it is in a sufficiently finely distributed state, it is possible to make a glass material which, firstly, in electrical respect constitutes an improvement as compared with ordinary glass and, secondly, in mechancial respect resembles sufficiently the ordinary glass so that the properties, as far as this point is concerned, are equivalent to those or ordinary glass; the elasticity is even improved while it can also more easily be formed.

The electric insulator according to the invention consists of a glass body in which gas bubbles are dispersed, characterized in that the volume of all gas bubbles together is 5 to 50% of the total volume and the average size of the gas bubbles is smaller than 200 microns.

When glass in which gas is dispersed is used for the insulation of sound and heat, one aims at making the volume of all bubbles together as large as possible in contradistinction to the invention. Such materials consequently have less advantageous mechanical properties and for this reason already they are less convenient for electrical insulation technics; for use with bodies of small thickness these materials are unsuitable.

As stated before, this difficulty does not exist with the electric insulator according to the invention owing to the limitation of the volume of all bubbles together and of the fineness of the individual bubbles, while the mechanical properties with regard to the elasticity, as compared with corresponding ordinary glass, are even improved so that it may be fused without difficulty to materials of greatly different coefficient of expansion and conduction of heat.

As a matter of fact, when glass in which gas is dispersed is used for objects which are luminescent as a result of gaseous discharges, the object is quite contrary to that of the invention. For this purpose the closed spaces in the glass material, as a consequence of particular measures in the manufacture, are filled with specially purified gases, for example rare gases, under such a gas pressure that, when using high frequencies and high voltages, discharges are produced in the individual gas bubbles which bring about the luminous effect.

Conditions which have for their object the production of gaseous discharges are avoided with the present invention.

When using gases, such as air, oxygen, nitrogen, carbon dioxide, hydrogen, mixtures of hydrogen and nitrogen, one obtains with the dispersion conditions according to the invention that disruption in the gas bubbles, also with alternating voltages of high frequencies, could not occur or could occur at most with exceptionally high voltages.

This may be further promoted by the use of carbon dioxide as a gasfilling, since the disruptive voltage thereof is highest and exhibits, in addition, a sharp minimum at a definite value of the product of the gas pressure and the size of the gas bubble.

Due to the numerous gas bubbles dispersed in the glass thus blocking the passage of current, one obtains, as compared with ordinary glass, a diminution of the dielectric constant, of the dielectric losses and of the electric conductivity. This improvement of electrical properties, expressed in per cent, is generally greater than the percentage of dispersed gas.

Electric glass insulators according to the invention may be obtained by heating finely powdered glass in a mould, if desired under a weak pressure, in such manner that flowing of the glass particles takes place, whilst avoiding so high temperatures that the gas bubbles would rise in the mass or join into larger bubbles.

If, for example, lead-glass powder having an average size of particles of 200 microns is heated in a graphite mould under a pressure of about 100 gr/cm^2 during 3 minutes at about 800° C in air, one obtains in the glass a gas dispersion, in which the average size of the gas bubbles is 40 to 80 microns and the volume of all bubbles together is 20%.

The properties of the material may be influenced not only by the choice of the gas pressure and the nature of the gas, but also by the choice of the size of the gas bubbles, of the volume of all bubbles together and of the composition of the glass. The size of the gas bubbles may be controlled by the choice of the size of the particles of the glass powder and, the volume of all bubbles together amongst others by the moulding pressure.

According to another embodiment of the invention, glass powder may be preformed by moulding, preferably with the use of an auxiliary material, as usual in ceramic technics, (for example bentonite), after which the object formed is heated a temperature which causes the desired flowing or the glass particles. This heating temperature will be somewhat lower than with the heating in a mould in order to avoid deformations; the heating time is then generally longer.

HENDRICUS JOHANNES LEMMENS.
EDUARD GERARDUS DORGELO.

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ALIEN PROPERTY CUSTODIAN

TRANSMISSIONS AND MEANS FOR OPERATING THE SAME

Karl Maybach, Friedrichshafen, Germany; vested in the Alien Property Custodian

Application filed July 2, 1941

My invention relates to transmissions and means for operating the same, especially of such clutch mechanisms as are used for change speed gears in tool machines, motor vehicles, for example in steering gear, brakes or other apparatuses of this kind. It has special reference to friction clutches operated by fluid pressure.

The main object of my invention is adaptability of the clutch to the efficiency wanted in every case, which means that only portions of the normal power acting on the clutch may be transmitted thereby for longer time periods.

For this purpose I provide a control or operating device for the clutch which allows for regulation of the pressure exerted on the clutch. And furthermore, the friction surfaces of the clutch elements are provided with channels allowing for a constant and quick passing of the lubricating and cooling oil.

This combination makes it possible that the friction clutch may operate for a longer time period with a certain slip depending upon the clutch pressure set and prevailing. By such friction clutch devices according to my invention every turning moment may be transmitted which is lower than the maximum moment for which the clutch is constructed.

Thus, the clutch mechanism according to my invention is capable of reducing the efficiency and the number of revolutions in a desired degree as compared with the normal conditions for a certain time, at least for several minutes. If a power transmission is equipped with one or a plurality of such mechanisms it becomes adaptable to any and every desired ratio of transmission in numbers of revolution or in efficiency. With change speed gears, in normal cases, it is sufficient to provide only two stages.

A transmission thus equipped is extraordinarily simple and accurate in operation and adaptable to the working conditions for example to the resistance offered to a tool machine. Also, changing from one stage or gear in a change speed gear to another one is rendered much easier because of the adjustable clutch pressure so that it is hardly to be observed.

As explained above, I make use of fluid pressure for operating the clutch. It is advisable, according to my invention, to provide a regulating device which automatically controls the clutch pressure in dependency on the pressure exerted on said device.

Having given a general description of my invention I now want to point it out more in detail having reference to the drawings which represent an example embodying my invention.

Fig. 1 is a diagrammatic, longitudinal cross section through a change speed gear in portion including the control mechanism; Fig. 2 represents a detail in side view; and Fig. 3 is a side view of the friction surface of the clutch.

In the change speed gear 1 on the driving shaft 2 are fixed gears 3 and 4. Gear 3 meshes with gear 5 and gear 4 with gear 6, gears 5 and 6 being loosely journaled on driven shaft 7. There are friction discs 9 and 10, splined to shaft 7 and adapted to be pressed against the side surfaces of gears 5 and 6, respectively, by means of pressure discs 15 and 16, respectively. On the side faces of the friction discs 9 and 10 special friction surfaces 13—17 and 14—18, respectively, are provided. Besides, the pressure discs 15 and 16 on their circumferences have teeth 19 and 20, respectively, fitting between guiding teeth 21 and 22, respectively, which are provided on gears 5 and 6, respectively, so as to make sure that pressure disc 15 rotates together with gear 5 and pressure disc 16 together with gear 6. For the purpose of shifting pressure discs 15 and 16 on shaft 7 so as to cause engagement of friction clutch 5—13—9—17—15 and of friction clutch 6—14—10—18—16, respectively, their hubs have circular grooves 23 and 24, respectively, into which forks 25 and 26, respectively, fit which form one end each of double levers 27 and 28, respectively. The other ends of these levers are connected to links 29 and 30, respectively, and these again to rods 31 and 32, respectively, belonging to pistons 33 and 34, respectively, situated inside of cylinders 35 and 36, respectively. Conduits 37 and 38 are connected to cylinders 35 and 36, respectively, for conducting pressure fluid thereto, adapted to act on pistons 33 and 34, respectively, against the reaction of springs 39 and 40, respectively. These conduits 37 and 38 originate from casing 50 which embodies the control mechanism.

There are two main borings 41 and 42 inside of casing 50 into which fit two piston valves 43 and 44, respectively, having cross channels 45 and 46, respectively, and longitudinal channels 47 and 48, respectively. Guided in longitudinal borings of the piston valves 43 and 44 are bolts or pins 53 and 54, respectively, which have rounded lower heads 51 and 52, respectively, pressed by means of springs 55 and 56, respectively, with their touching surfaces 63 and 64, respectively, against cams 59 and 60, respectively, provided on shaft 65. There are springs 57 and

58 inside of borings 41 and 42, respectively, tending to shift valves 43 and 44, respectively, downward against the reaction of springs 55 and 56, respectively. There is a fluid pressure pump, for instance an oil pump, 67 which presses oil into conduit 68 and thereby into the middle boring in casing 50 wherefrom it may enter by means of cross channel 69 into cross channels 45 and 46 of valves 43 and 44, respectively, on adequate positions of these valves which are controlled by turning hand wheel 66 situated on shaft 65. If the oil pressure in spaces 41 or 42 surpasses a certain limit it causes valves 43 and 44, respectively, to move downward so that cross channels 45 and 46, respectively, get in connection with cross channel 72 and longitudinal channel 71, which opens into the inner space of casing 50 allowing the pressure oil to escape, thereby reducing the pressure in spaces 41 and 42, respectively, so that the valves 43 and 44 will always automatically return to their neutral positions, as represented in the drawing.

The friction surfaces 13/17 and 14/18 are provided with radially extending grooves or open channels 80 of small cross section, so that the lubricating oil entering at the hub may easily be transported to the circumference by centrifugal force, thus causing good lubrication and also serving for reducing the heat which is created when the two respective clutch members rotate at different speeds.

The shape of the cams 59 and 60 is so chosen that on normal rotation of hand wheel 66 the bolts 53 and 54 are only slowly lifted in the beginning and faster at the end of their path, so that the oil pressure in the cylinders 35 and 36, respectively, is slowly raised at the beginning and increases faster at the end of the stroke of pistons 33 and 34, respectively. Thus the friction clutches 5—13—9—17—15 and 6—14—10—18—16 are compressed in the same manner.

The operation of the entire device is as follows:

Assuming the hand wheel 66 be at rest in the position in which both bolt heads 51 and 52 bear on the lowest cam circumference 75 (Fig. 2) and it be thereafter turned to the left so that bolt 53 is slowly lifted its head 51 following the shape of cam 59. This movement of head 51 causes compression of spring 55 and as a result therefrom piston valve 43 moves upward allowing pressure oil to pass from channel 69 through channels 45 and 47 into the space 41 above the valve 43 and thereafter through conduit 37 into cylinder 35. Consequently, piston 33 is moved to the right so that by means of lever 27 pressure disc 15 is pressed gradually against friction disc 9 causing the friction clutch 5—13—9—17—15 to get into engagement slowly and in dependence on the operator's turning of the hand wheel 66. If he does not turn the wheel at once to the position in which bolt head 51 bears against the highest portion of cam 59 but makes a rest inbetween, then the oil pressure in cylinder 35 will not reach its maximum and piston 33 gets at rest at some position in the middle of its path so that the friction clutch 5—13—9—17—15 will not come to full engagement but have a certain desired slip which means that shaft 7 will turn at a lower speed than would correspond to the gear ratio of gears 3 and 5. All this is due to the fact that valves 43 and 44 automatically return to their neutral middle position, as explained above.

If it is desired to change from the first speed to the second speed, which means disengagement of friction clutch 5—13—9—17—15 and engagement of clutch 6—14—10—18—16, hand wheel 66 has to be turned further to the left so that bolt head 51 sliding on the right hand portion of cam 59 (Fig. 2) moves downward causing reduction in the pressure of spring 55 which again results in downward movement of valve 43, escape of pressure oil from cylinder 35 through conduit 37 and channels 47, 45, 71 and 72, movement to the left of piston 33, and disengagement of friction clutch 5—13—9—17—15. Thereafter bolt head 52 is lifted by cam 60 and, in similar manner as described above with regard to valve 43, now valve 44 gets into operation causing pressure oil to pass through conduit 38 into cylinder 36, thereby moving piston 34 to the left and engaging friction clutch 6—14—10—18—16 more or less in dependence on the angle to which hand wheel 66 is turned. In certain cases, it may be advisable to give the cams such a shape that the operation of the second valve 44 is caused before the first valve 43 has come to its final rest, as shown in Fig. 2.

Of course, it is possible to cause only any desired partial friction pressure in clutch 6—14—10—18—16 in absolutely similar manner as described above relative to friction clutch 5—13—9—17—15.

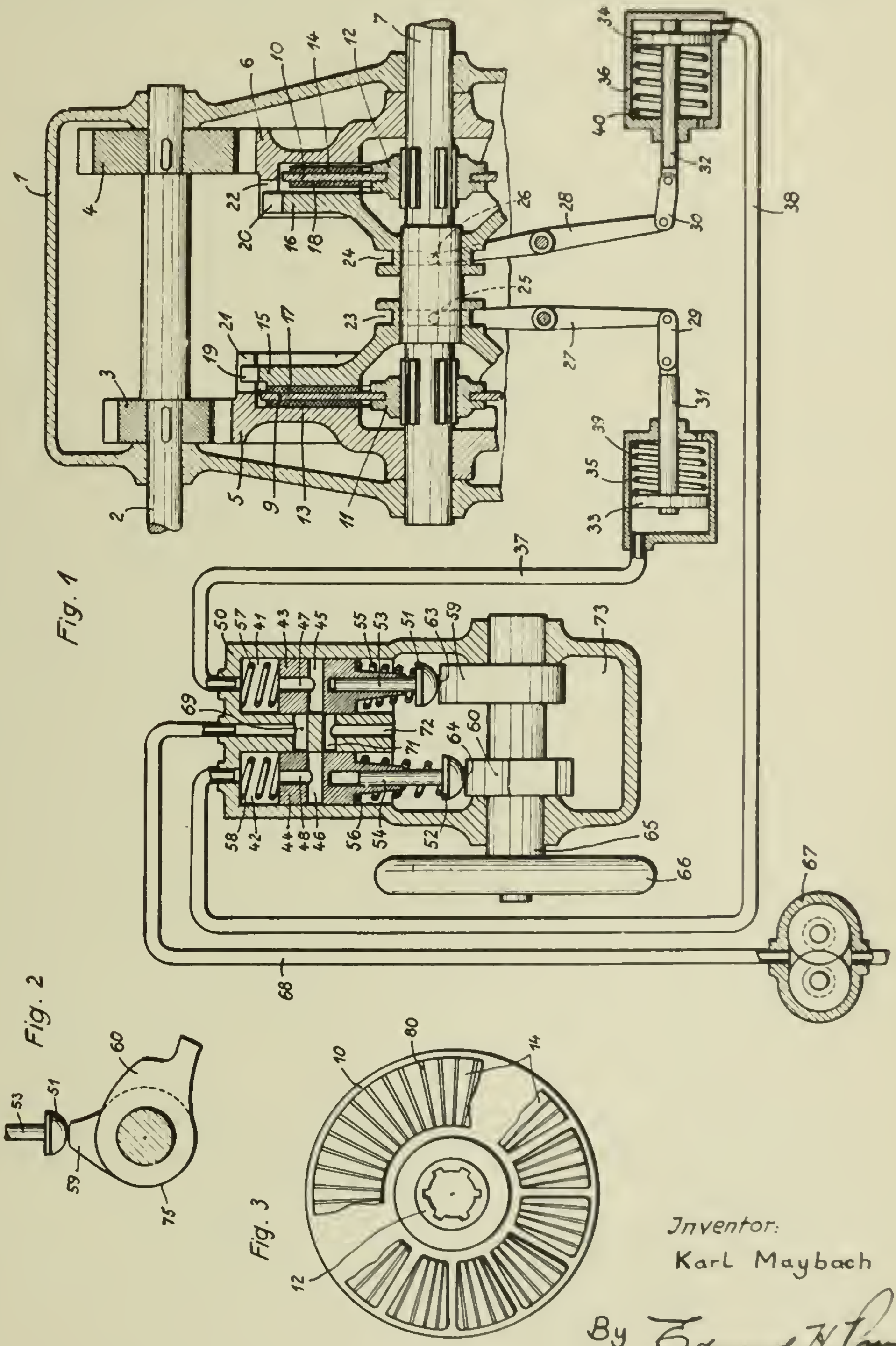
I do not want to be limited to the details described or shown in the drawings as many variations will occur to those skilled in the art without deviating from the scope of my invention.

KARL MAYBACH.

PUBLISHED | K. MAYBACH | Serial No.

MAY 18, 1943. TRANSMISSIONS AND MEANS FOR OPERATING THE SAME 400,817

BY A. P. C. | Filed July 2, 1941



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Published May 18, 1943 Serial No. 401,131

ALIEN PROPERTY CUSTODIAN

DRY RECTIFIER DEVICES

Heinrich Herrmann, Nürnberg, Germany; vested in the Alien Property Custodian

Application filed July 5, 1941

The present invention relates to dry rectifier cells and similar rectifying means, and more particularly to rectifier devices in which the material of the base plate or electrode is preferably selected from the group of the light metals.

It is well known in the rectifier art, and in the first instance in connection with selenium rectifier cells, to use as the constituent of the base plate or electrode either a metal selected from the iron group, or to produce this base plate from another metal and subsequently to cover this plate with a layer of nickel or any other metal selected from the iron group. These last named metals are particularly advantageous since they generally do not form any chemical compounds with the selenium subsequently applied thereon as the semi-conductor layer of the rectifier cell, and if such compound would be formed, it occurs as a highly conductive selenide offering a very minute ohmic resistance in the current transfer direction so that the ohmic losses may be reduced to an extremely low value.

In the manufacturing process of the heretofore known dry rectifier cells, the above-mentioned layer of nickel was applied to the base plate or electrode either by plating or by electrolytic precipitation. In order to provide for an adequate adherence between the nickel coating of the base plate and the selenium layer to be applied thereon, this coating must be roughened, and this roughening process is generally accomplished by means of a sand blasting apparatus. However, in the manufacturing process heretofore known, this roughening has always required an additional step of operation and consequently increased expenditure and, moreover, it does not allow the base plate of being only partially covered with nickel, which by several reasons might frequently be highly desirable.

In accordance with one object of this invention there is proposed a new and useful method of manufacturing dry rectifier cells in a correspondingly simplified process which permits the application of the nickel layer on the base plate and the roughening of the base plate and the nickel coating, respectively, which roughening is inevitably necessary in order to provide proper adherence of the overlaying selenium on this nickel plating, to be carried out in one single operational step.

It is a further object of this invention to provide a base plate of a dry rectifier cell which can be only partially covered with a nickel layer, while the uncovered portion thereof may be used for other purposes, say as a cooling vane, in order to maintain the operating temperature of such rectifier devices at a proper value.

The main object of this invention is accomplished by spraying the nickel onto the base plate or electrode, preferably by means of a Schoop spraying pistol. Thus, the molten nickel particles violently impinging on the underlaying base plate effect its roughening at the same time in which these particles built up to a continuous layer of nickel.

This and other objects of the invention will be fully understood from the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 shows a cross section of a rectifier cell according to the invention, while Fig. 2 shows a plan view of the same embodiment. The thicknesses of the various layers constituting the cell according to Fig. 1 are shown in a highly exaggerated scale in order to obtain a clear representation.

With reference to the Figs. 1 and 2 there is shown a base plate or electrode 1 preferably consisting of a metal selected from the group of light metals. A part of this plate, that is, its center portion, has simultaneously been roughened when molten nickel particles have been sprayed thereon preferably by means of a Schoop spraying pistol, for instance, by masking the outer region of the plate by means of a stencil or the like which exposes the inner region of the plate. On this rough top surface of the nickel coating 2 an active selenium layer 3 has been applied in accordance with any method well known in the art. Finally, the selenium layer 3 has been covered with a metal alloy having a low melting point and constituting the second or counterelectrode of the rectifier cell. Now, the outer region of the base plate or electrode 1 may serve as a cooling fin which is particularly advantageous in a rectifier device of this design since the base plate together with the semi-conductor layer 3 and its intermediate coating of nickel forms a substantially integral unit by means of which the heat developed in the active part of the rectifier may be readily withdrawn therefrom and conducted to the ambient air.

The method of applying the nickel coating to the base plate by spraying as taught by this invention permits the base plate to be only partially coated by nickel in that region which actually is to be covered with selenium, while leaving the remainder of the base plate uncovered. It is thus possible when using this novel method to save a considerably amount of nickel. It is also

possible according to this invention to provide a light metal base plate with a nickel coating within a short time and without the laborious preparations and other difficulties generally encountered when the nickel layer was applied by electrolytical precipitation.

The present invention is not limited to rectifier cells in which the nickel layer is applied to a base plate of light metal in a metal spraying process, since even such rectifier devices are considered to fall within the scope of this invention wherein a base plate of any conductive metal is coated by spraying thereonto a metal other than nickel, which metal is capable of constituting a proper underlaying coating for the layer of selenium to be applied thereon in a later step of the manufacturing process, or wherein the base plate consists of an insulating material having a suitable metallic coating applied thereto whereby means are associated with the said coating for establishing electrical connections therewith.

HEINRICH HERRMANN.

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BY A. P. C.

H. HERRMANN
DRY RECTIFIER DEVICES
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Fig. 1

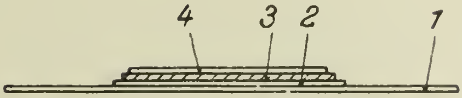
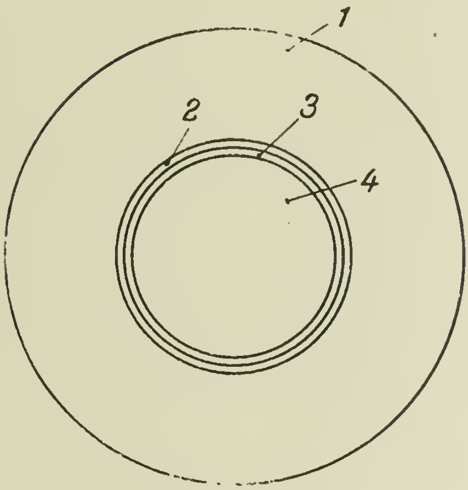


Fig. 2



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BY

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Serial No. 400,988

ALIEN PROPERTY CUSTODIAN

REGENERATIVE COKE OVENS

Nikolaus M. Philipsen, Tokyo, Japan; vested in the Alien Property Custodian

Application filed July 3, 1941

The general object of the present invention is to improve the construction of horizontal regenerative coke oven batteries having groups of vertical heating flues each comprising a small number of flues connected at their upper ends. For example, each such group may consist of two limbs of a twin or hairpin flue.

The invention is characterized by the association with each such small group of flues of a separate group of vertical regenerators which are located within an individual space formed in the coke oven brickwork beneath the heating walls and coking chambers, and which comprise a multi-chambered regenerator housing supported independently of the walls of said chambers by a subjacent support on which the housing may slide or rock as the battery expansion causes the upper end of the housing to move horizontally relative to said support. The regenerator housing may be thus supported on a grate-like reinforced concrete supporting deck for the coke oven brickwork or on iron base plate supported by said deck. Each regenerator housing is thus free to tilt or slide as a result of battery expansion without being subjected to lateral pressure or thrust by the portions of the coke oven brickwork forming the walls of the chamber in which the housing is received, which facilitates the maintenance of gas-tight walls between the different vertical regenerator chambers or cells formed in each housing regenerator.

In a hairpin flue oven constructed in accordance with the present invention, the binder walls extending transversely to main supporting walls beneath the different oven chambers, may be constructed independently of said supporting walls and each may be formed with two uprising channels for supplying rich fuel gas alternately to the two vertical flues forming the limbs of a hairpin flue and separated by a flue division wall directly above said transverse binder walls. Advantageously the two rich fuel gas supply channels for adjacent twin flues have their upper ends extending into the corresponding flue division wall and terminating in burner outlets opening at opposite sides of said division wall.

In the preferred form of the present invention a transverse individual waste heat channel is provided in the basement space of the battery beneath each heating wall, and vertically adjustable valves are provided for connecting the lower end of each regenerator chamber associated with the heating wall alternately to the waste heat channel and to an adjacent transverse supply pipe for the combustible agent, i. e., combustion air or lean gas, preheated in that regenerator chamber. To effect the reversal of said valves they may be provided at their lower ends with pins or other cam engaging parts operatively engaging cams carried by reciprocating cam shafts located in the basement space of the battery and extending transversely of the later, or, in another form of the invention, each valve may be provided with individual fluid pressure operating means.

As each heating wall operates entirely independent of the other it is possible to separately reverse the direction of gas flow through the flues of the individual heating walls and associated regenerators, and to reverse the flow through the different heating walls of the battery successively in the course of a half reversal period. For this purpose the reversal mechanism for each heating wall must necessarily be so designed that its operation may be chronologically independent of the operation of the reversing mechanisms for the other heating walls.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages, and specific objects attained with its use, reference should be had to the accompanying drawing and descriptive matter in which I have illustrated and described preferred embodiments of the invention.

Of the drawings:

Fig. 1 is a vertical section through a portion of a coke oven battery taken transversely of the length thereof on the broken line 1—1 of Fig. 2;

Fig. 2 is a vertical section with its right hand portion taken on the line 2—2 of Fig. 1 except for a lower left hand portion taken on the line 2A—2A;

Fig. 3 is a partial section taken longitudinally of the battery on a larger scale than Fig. 2 and showing regenerator connection details not shown in Fig. 2;

The drawings illustrate the use of the invention in a horizontal underfired coke oven battery having twin flues in its heating walls which alternate along the length of the battery with transversely extending coking chambers 1. In accordance with the present invention the coke oven masonry is of relatively strong and rigid design and is formed for the most part of bricks which may be of ordinary rectangular brick shape. The said masonry comprises walls 2, one directly beneath and parallel to each coking chamber.

Each heating wall is formed with runner brick walls 3 extending longitudinally of the heating wall and forming the side walls of the heating flues, and binder brick walls 4 which are transverse to the walls 2 and separate the adjacent twin flues of the heating wall. Directly beneath each heating wall 4 is a wall 4A extending across the space between the two adjacent walls 2. The walls 3 and 4 extend to and directly support the oven roof structure which is traversed by the usual inspection holes 5 and charging openings 6.

The coke oven masonry rests upon a grate-like reinforced concrete deck or structure including girders 8 extending transversely of the battery and cross girders 9, one directly beneath each of the walls 4A. The grate-like structure which is located at the ceiling of the characteristic subway space of the underfired battery is supported by columns 45 extending upward through the basement space and resting on the usual battery foundation, not shown.

Each adjacent pair of walls 4 and the two subjacent walls 4A and adjacent portions of the walls 2 and 3 enclose a shaft or vertically elongated space generally rectangular in cross section and including in its upper portion a twin flue and including in its lower portion four regenerator cells, two of which are connected to the lower end of one limb and the other two of which are connected to the lower end of the second limb of the corresponding twin flue. The four regenerator chambers in each masonry shaft are formed in a housing structure comprising three walls 10 extending longitudinally of the walls 2 and three cross walls 11. The central cross wall 11 is connected by a centering pin part 42 to a vertical brick wall 12 midway between the corresponding binder brick walls 4 and separating the two limbs of the corresponding twin flue except for a connecting port provided at the top of the wall 12. Each regenerator housing structure rests upon a corresponding cast iron base plate 13 directly engaged by the central cross wall 11. The plate 13 serves as a closure for the corresponding regenerator or space and is removable to permit the removal and replacement of the regenerator housing. The plate 13 also supports the weight of the stacks of checker bricks in the corresponding regenerator cells or chambers through ribs 14 arranged on the plate 13 at a short distance from the inner sides of the walls 10 and 11. The ribs 14 are arch like having convex upper sides directly engaged by and supporting the lower most checker bricks. In consequence the checker brick stacks can follow the movements of the walls 2 and 4*a* independently of the battery expansion. The regenerator housing and checker brick stacks thus work in the manner of pendular supports.

The spaces between the ribs 14 and the housing walls 10 and 11 may be filled with a flexible or granular packing material so that notwithstanding the relative movements of the individual parts, gas tight seals between the lower end of the different regenerator chambers may be maintained. The spaces between the regenerator checker bricks and the regenerator housing walls can likewise be filled with a suitable refractory material; for example, loose ceramic cement.

Each cast iron base plate 13 is formed with an opening or port 16 directly beneath each of the regenerator cells above it, and beneath the plate 13 is a trough shaped metallic member 18 which unites with the base plate above it to form a waste heat sole channel 19. As shown, said metallic member 18 has outturned flanges 17 at the upper edges of its side wall portions 17, which bear against the underside of the plate 13 and may be secured to the latter by the bolts 40 provided to detachably connect the plate 13 to the reinforced structure above it. As shown in Fig. 2, the bolts 40 are connected at their upper ends to the ends of beams or bars 41 which extend across the girder portions of the deck member. Supplemental plates welded to each member 18, unite with the latter to form a lean gas distribution channel 20 alongside one, and a combustion air distribution channel 21 alongside the other of its walls 17. Each of said distribution channels may extend from one side of the battery to the other.

The two regenerator chambers connected at their upper ends to the same twin flue limb are separately connected at their lower ends, one to the corresponding lean gas channel 20 and the other to the corresponding combustion air channel 21, each through an individual valved connection. Each of said connections comprises a vertically movable tubular valve element 22 which carries a valve head 23 at its upper end. The latter in its elevated position closes communication through the port 16 between the corresponding regenerator chamber and the waste heat channel 19, and such communication is established when the valve head is moved into its lowermost position shown in dotted lines in Fig. 2. In the last-mentioned position the tapered lower edge 25 of the lower end of the tubular member 22 engages the valve seatt 24 and closes communication between the bore 26 of the tubular member and an annular space 27 formed in the valve housing member 32 in which the tubular part 22 and valve seat 24 are mounted, said annular chamber 27 being in communication with the corresponding distribution channel 20 or 21 through a pipe connection comprising pipe sections 28 and 29 and an elbow fitting 30. The central passage 26 or bore of the tubular member 22 is in open communication with the regenerator chamber above it through openings 25 in the valve head 23.

The rate at which lean gas is supplied through each passage 26 may be regulated by the use of adjustable or replaceable throttling elements of usual or suitable form. Thus, as shown by way of example, a throttling pin 44 extending axially into the lower end of the passage 26, through the lower end of the housing 32 may be axially adjusted from the basement space of the battery to move pin portions of different diameters into throttling relation with the passage 26.

The valve members 22 may be adjusted in one direction or the other at suitable reversal periods by suitable reversing mechanism which may be of any suitable form. As shown, each valve member 22 is provided with individual fluid reversing means comprising an external or annular piston part 31 surrounding the body of the valve member and working in a cylinder space 33 formed in the valve housing 32. Pipe connections 34 and 35 connected to the upper and lower ends of the chamber 33, form means for increasing the pressure above the piston 31 to effect a down movement of the valve 22, and for increasing the pressure below the member 31 to effect the reversal or up movement of the valve member.

Instead of heating the battery by the combustion of lean fuel gas regeneratively preheated, all of the regenerator chambers may be used in preheating combustion air then supplied through

the distribution channels **20** as well as through the distribution channels **21**, and rich fuel gas may then be supplied to the heating flues through channels **36** two of which extend upwardly through each of the walls **4**a, and terminate at their upper ends in burner outlets formed in the superposed wall **4** and opening respectively, at suitable levels to the heating flues at the opposite sides of the wall **4**. Rich fuel gas is supplied to one channel **36** of each pair through branches **37** from a horizontal distribution pipe **38** during periods alternating with those in which rich fuel gas is supplied to the other channel of the pair through the branches **37** from a second horizontal distribution pipe **38**. The pipes **38** may be associated with reversing valves, not shown, in the usual manner. The riser pipe portions of the pipe connections **37** have their upper ends embedded in the corresponding cross girders **9** and in register with the lower ends of the channels **36**.

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REGENERATIVE COKE OVENS

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Serial No. 400,988

2 Sheets-Sheet 1

Fig. 1.

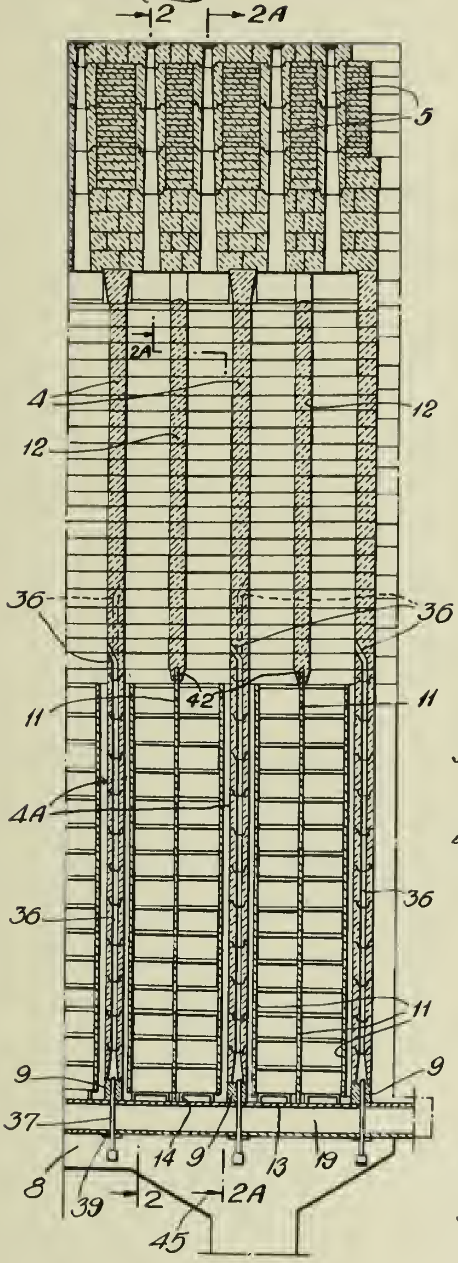
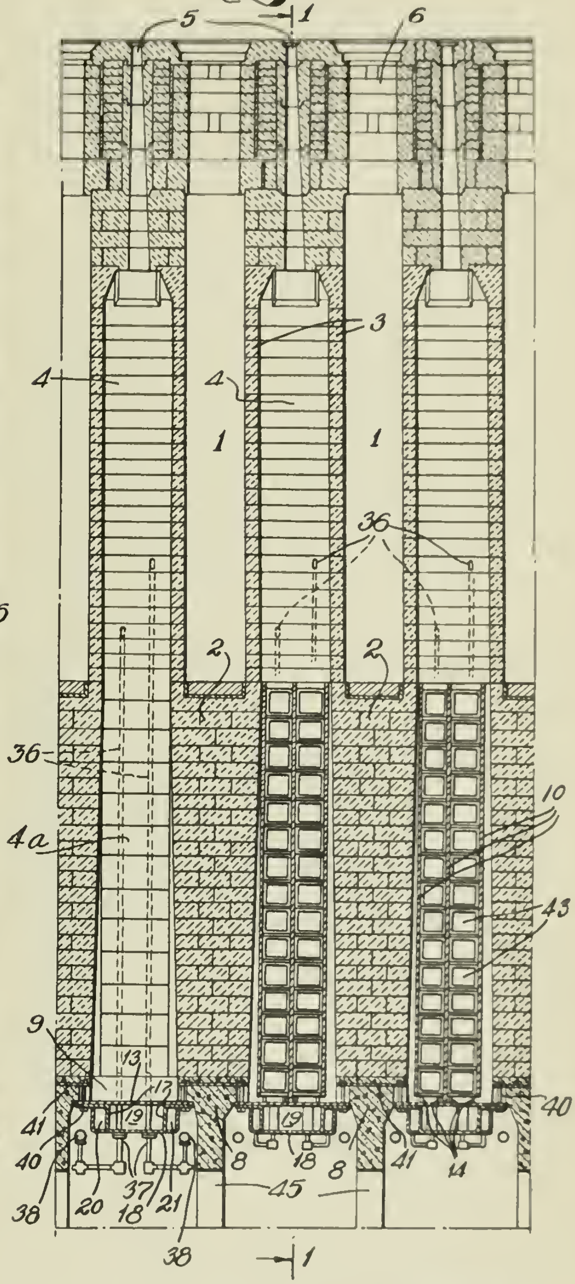


Fig. 2.



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REGENERATIVE COKE OVENS
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Serial No.
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2 Sheets-Sheet 2

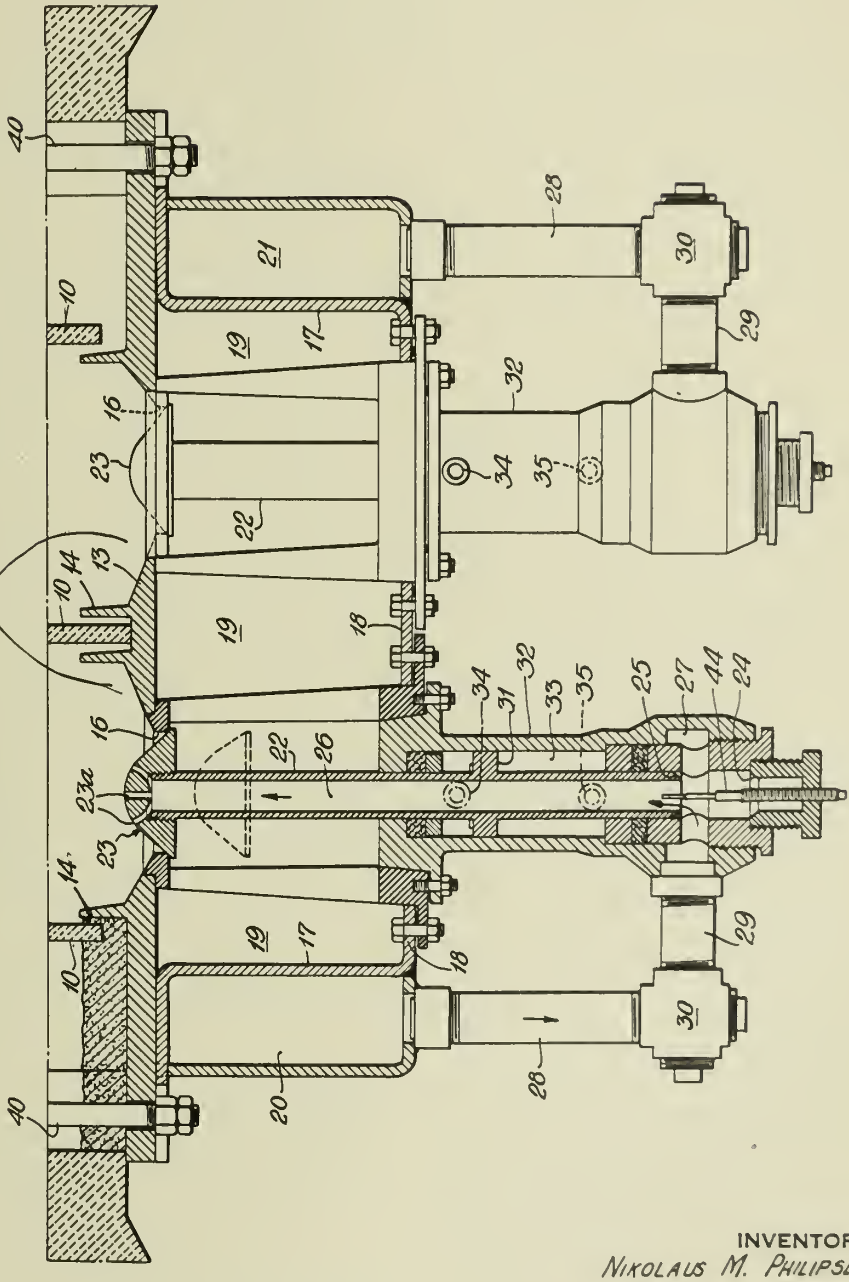

Fig. 3.

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ALIEN PROPERTY CUSTODIAN

HOT ELECTRODES FOR ELECTRIC DISCHARGE TUBES

Vladislav Bubeník, Zlin, Bohemia and Moravia; vested in the Alien Property Custodian

Application filed July 7, 1941

The present invention relates to electric discharge tubes filled with gases, or vapors, or mixture of gases and/or vapors, and the object of the invention is to provide a hot electrode for electric discharge tubes of the specified type.

In order to start the discharge in electric discharge tubes filled with gases, or vapors, or mixtures of gases and/or vapors at a potential as low as possible it is necessary to promote the ionization along the discharge path between the main electrodes. The desired result may be obtained by preliminary ionization of the gaseous filling in the neighborhood of the main electrodes; in the devices as heretofore known special auxiliary electrodes are used for this purpose, the auxiliary electrodes being arranged in the discharge tubes adjacent to the main electrodes. Such auxiliary electrodes as are known and used heretofore either are supplied with current from outside, or are in direct conductive communication with the one or the other end of the hot filament, the drop of potential across the auxiliary electrode and the main electrode being effective to produce ionization of the gaseous filling in the vicinity of the main electrode, wherefrom the ionization is propagated along the whole spacing between the main electrodes.

The ionization of gases and vapors depends not only on the composition of the filling and its pressure but also on the potential across the electrodes and on the spacing of the same. Therefore, when designing the main and auxiliary electrodes attention should be paid to all those factors.

Assuming that a given gaseous filling is used under a constant pressure the ionization I will be a function of the potential E and the spacing d between the electrodes

$$I=f\ (E,\ d)$$

Similarly the auxiliary ionization at the electrodes will be a function of the drop of potential across the hot filament of the main electrode (E_{aux}) and the spacing between the electrodes under consideration (d_{aux})

$$I=f\ (E_{aux},\ d_{aux})$$

An object of the present invention is to provide a hot electrode for electric discharge tubes which is so arranged as to make superfluous the use of any auxiliary electrode.

The essence of the invention consists in that the supply itself of electric current to the hot filament acts as an auxiliary electrode; in other words the drop of potential across the lead-in wires for the electric current and the hot filament causes ionization of the gaseous charge to take place in the vicinity of the main electrode to such an extent that the potential across the two main electrodes then becomes sufficient to start the discharge.

The choice of the hot filament according to the present invention is determined by the lowest necessary drop of potential across the filament (equal to the required potential for the auxiliary ionization), and the distance dx (Fig. 1) between the hot filament and the lead-in wire may be deducted from the above mentioned relation:

$$dx=f\ (E_{aux})$$

The drawing illustrates by way of example several embodiments of the invention.

The electrode shown in Fig. 1 represents a simple practical form of the hot electrodes according to the invention. The ionization takes place between the points A and B. The required potential for the ionization is provided by the drop of potential itself across the points A and B on the hot filament. The ionization takes place only when the point A is positive with respect to the point B. With alternating current this condition is complied with only during one of the two half-waves.

In the embodiment shown in Fig. 2 the electrode is so designed as to be exactly symmetrical so that the ionization does not depend on the polarity of the electrode ends, since during the two half-waves of alternating current the operation is the same and the sense only is changed. Therefore the ionization takes place during either half-wave of alternating current.

Fig. 3 also shows an electrode which is symmetrical with respect to the axis and represents a modification of the electrode shown in Fig. 2. The middle part of the spiral, which is subdivided into two parts, is supported on a carrier I. Between the points I, J, K ionization takes place during both half-waves of alternating current.

Fig. 4 shows a form of the invention wherein the filament extends at right angles to the axis of the socket. In this embodiment a part only of the drop of potential across the hot filament is utilized, namely that part which corresponds to the points M and N.

Ionization takes place during either half-wave of alternating current.

The electrode shown in Fig. 5 represents substantially a combination of the electrodes shown in Figs. 1 and 2. The ionization is effected at two places during either half-wave.

The above described constructions may be modified within wide limits without departing from the scope of the invention.

VLADISLAV BUBENÍK.

[illegible]

PUBLISHED MAY 18, 1943. BY A. P. C.

V. BUBENIK

HOT ELECTRODES FOR ELECTRIC DISCHARGE TUBES

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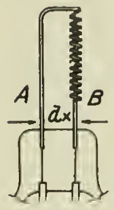

Fig. 1.

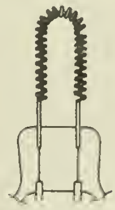

Fig. 2.

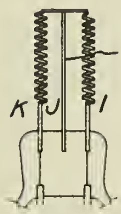

Fig. 3.

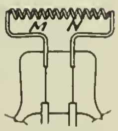

Fig. 4.

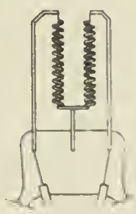

Fig. 5.

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ALIEN PROPERTY CUSTODIAN

BLOCKING LAYER CELL UNIT

Cornelis de Lange and Charles Louis Boucher, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed July 8, 1941

The invention relates to a blocking-layer cell unit, for example a rectifier, which is composed of a plurality of supporting plates which support the blocking-layer cells whilst also cooling plates are utilised.

In the case of a rectifier, for example, such rectifier units are built up from separate rectifier cells in order to be able to satisfy the electrical requirements for the rectifier as regards voltage and current intensity, by series- or parallel-connection or by combinations thereof.

According to a very usual method the supporting plates on which the blocking layer cells are built up from the required layers, are perforated and slipped on a supporting bolt with the interposition of the required cooling plates and contact strips and also insulating rings at the points where the electrodes of the various cells must remain insulated from one another. The contact strips lead in this case in different directions to the exterior of the unit where at some distance from one another the mutual electrical connections and the connections with the supply terminals are established. Sometimes part of these supply conductors is connected directly to the supporting plates on the cooling plates, for example by soldering. This method has the drawback that a rather large number of constituent parts is needed for the construction whilst the connections become unsurveyable and can frequently be provided only with difficulty.

According to the invention, these drawbacks are eliminated owing to the fact that the supply conductors for the electrodes of the blocking-layer cell are led to a contact bar provided outside the unit and supported by the latter.

In this case the contact bar consequently forms a separate member which is supported by the unit itself and which possesses, insulated from one another, all the connecting points whilst furthermore this member carries in its turn all the connecting elements for the electric circuit-arrangement to be established.

In the preferred embodiment of the invention the supply conductors pertaining to a supporting plate and leading to the contact bar are directly mechanically connected to this supporting plate and are carried by the latter plate. The stored supporting plates with the blocking-layer cells provided thereon are consequently also provided with the supply conductors rigidly connected thereto and in assembling the rectifier unit it is only necessary to place the number of supporting plates required for the required output, in succession and to connect them mechanically whilst the supply conductors which are already present may be directly connected to the contact bar placed on the unit.

If a plurality of blocking-layer cells are present on each supporting plate, this principle is preferably also utilised by constituting the supply conductors for the electrodes located on the outside of these cells by wires which are all of them connected to a single wire which leads to the contact bar and which is mechanically connected to the supporting plate, for example, owing to its being clamped in an insulating sleeve which passes through an aperture of the supporting plate.

The invention will be explained more fully with reference to the accompanying drawing wherein

Fig. 1 is a lateral elevation and

Fig. 2 is a front elevation of a blocking-layer rectifier composed in accordance with the invention whilst

Fig. 3 shows separately a lateral elevation and an end-elevation of the contact bar.

The rectifier consists of a plurality of blocking-layer plates 1 whilst on one of its sides each plate carries a selenium layer which constitutes the one electrode of nine rectifier cells which are obtained by applying by spraying a layer, acting as the counter electrode, of an alloy of tin, bismuth and cadmium which has a melting point of about 100°. The latter layer is divided with the aid of a pattern into nine panes as may be seen from Fig. 2. Between the selenium electrode and the so-called counter-electrode produced from the alloy is formed in the known manner a blocking-layer and thus nine separate rectifier cells are produced. The selenium electrode is not shown in the figures, the counter-electrodes 2 being shown only in Fig. 2. For the purpose of cooling each rectifier plate is provided with three U-shaped beams 3, 4 and 5 which are rigidly connected thereto. The rigid connection is obtained by providing flanged bushes in holes 6 of the supporting plate and in apertures of the U beams which correspond thereto. The rectifier plates provided with these U-beams are united, with the interposition of insulating spacing members 7, for example glass rods, to form stack-elements whilst they are kept assembled by means of tension rods 8, 9 and 10 which are passed through the holes of the previously mentioned flanged bushes.

On either side of the rectifier unit strips 11 and 12 extend from the connecting beam 10 upwards, said strips carrying a contact bar 13 placed on the tops of the U beams. By a plurality of

notches as shown, for example, at 14, this contact bar engages corresponding notches in the bases of the U-beams, thus stiffening the construction.

Each rectifier cell 2 is provided with a connecting wire which is connected to the counter electrode by means of a soldering contact as is shown, for example, at 15 and 16. The connecting wires, two of which are denoted by 17 and 18, lead to a central point of the supporting plate 1, in the present case the flanged bush 19, which is provided with an insulating sleeve 20. At this point the various connecting wires are all of them soldered to the end of a wire 21 which is clamped in the insulating sleeve and which leads upwards to the exterior of the rectifier unit where it is connected to a contact strip 22 of the contact bar 13. To the supporting plate 1 is welded a wire 23 which is connected to a contact strip 24 of the contact bar, all the rectifier cells on the supporting plate being thus connected in parallel. The same occurs for the following rectifier plates and, as may be distinctly seen from Fig. 3, we thus obtain on the contact bar a plurality of contact strips with the aid of which all the connections desired may be established. In soldering the connecting wires use is made of soldering tags 25 which are shown in Fig. 3b. The contact strips which are to be interconnected, may all of them be bent over to the outside over an equal distance and be connected by means of a straight wire.

It is evident that this construction renders it possible to make the rectifier plates provided with the supply conductors connected thereto completely ready since these supply conductors are mechanically connected to the supporting plate and are of completely uniform construction. The supporting plates with the supply conductors constitute stack-elements which, when rectifiers have to be delivered, may be stacked up in the desired number with the interposition of the spacing members 7 whereupon the connecting bolts 8, 9, 10 and the contact bar 13 of corresponding length are provided and the supply conductors 21, 23, etc. are soldered on to the contact bar.

The number of components to be stored is very small and the rectifier units may be assembled in an extremely short time for greatly varying powers whilst the construction remains very surveyable and varying mutual connections of the rectifier elements may be established within a short time.

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C. DE LANGE ET AL
BLOCKING LAYER CELL UNIT
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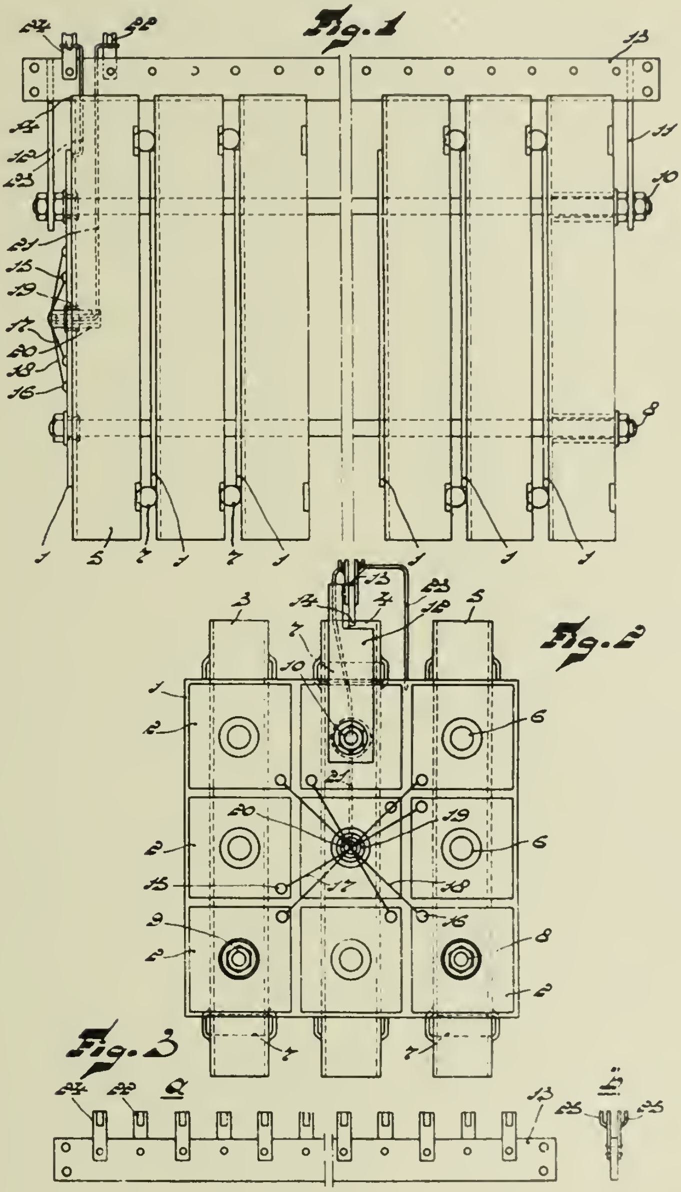

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ALIEN PROPERTY CUSTODIAN

DEVICE FOR THE STEREOPHONIC REGISTRATION, TRANSMISSION AND REPRODUCTION OF SOUNDS

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Application filed July 8, 1941

The invention relates to a device for stereophonically recording or transmitting sound waves and to an accompanying device for the stereophonic reproduction of the recorded or transmitted sound waves.

For the stereophonic transmission of sound use is made, for example, of two microphones which pick up the sound to be transmitted and which are placed at a distance equal to the distance between the ears (about 22 cms) on either side of a body by which sound waves are screened and each of which supplies, with the interposition of an amplifier and a transmission line of its own, one of two earphones on the ears of the listener. It is also possible to arrange the above-mentioned microphones at a larger distance (about 2 metres) from one another without utilizing a screening body.

The two microphones take in this case more or less the place of the two auditory organs and since in the reproduction we listen to two telephones to each of which are supplied the oscillations of the corresponding microphone we obtain the illusion of an acoustic perspective.

In the reproduction of sound for a great audience it is a drawback that each listener must be provided with a headphone. By experiments it has proved to be possible to obtain a proper stereophonic effect by utilizing two loudspeakers arranged at a suitable distance from one another. A favourable arrangement of the loudspeakers is described in "Philips Technisch Tijdschrift" of April 1940.

In leading electrical oscillations from the microphones to the headphone or to the loudspeakers there may be interposed recording and scanning devices by which the sound is first recorded on a sound carrier and is then scanned again.

The oscillations proceeding from each of the microphones, may also be transmitted after modulation on a carrier wave, by wireless.

The method of stereophonic transmission above referred to has the drawback that always two channels are necessary whilst with the interposition of a recording equipment, in addition, either double the number of gramophone records of film bands or a double sound track on the film band is required.

In the case of transmission by wireless the inconvenience of a completely double channel may be partly eliminated by utilizing a particular modulation system, for example, by transmitting the oscillations coming from the one microphone as the lower side-band of the carrier wave and the oscillations coming from the other microphone as the upper side-band of the same carrier wave, in which event, however, receivers of particular construction have to be utilized.

In recording on gramophone records great difficulties are encountered in the isochronous scanning of the two sound tracks; the slightest displacement therein is liable to destroy the illusion of acoustic perspective. The recording and the production of a double sound track on one and the same gramophone record entails practical difficulties; besides, a double scanning and amplifying installation would remain necessary. In recording on a film band there is generally no room for a second sound track whilst also the necessity of a double installation would subsist.

The invention has for its object to effect the stereophonic recording, transmission and reproduction in such manner that only a single recording installation is required or that substantially the whole of the transmission channel may be formed as a single channel so that the above-mentioned drawbacks are eliminated.

According to the invention, mutually complementary bands of frequencies are taken from the electrical oscillations furnished by the microphones or groups of microphones arranged at some distance from one another, whereupon these frequency bands are jointly supplied either to a recording apparatus common to them for the purpose of being registered on a single sound carrier or to a channel common to them for the purpose of transmission.

Furthermore, in the stereophonic reproduction of sound the oscillations obtained by scanning the common carrier or the electrical oscillations transmitted via the common channel are separated, according to the invention, into the initial bands and supplied respectively to the two earphones or loudspeakers.

The sound carriers produced according to the invention have a sound track which is an image of the mutually complementary frequency bands of the oscillations of the stereomicrophones and are suitable for use in a device for stereophonically reproducing sound oscillations.

In carrying the invention into effect use may be made of the usual equipments for taking up, recording and reproduction without the need of radical changes whilst, in addition, in the reproduction with the aid of apparatus which are not designed for stereophonic reproduction a normal non-sterephonic reproduction is obtained.

The invention will be explained more fully with reference to the diagrammatic figures shown in the drawing.

Fig. 1 shows diagrammatically the arrangement of an example of construction of a complete transmitting and receiving device according to the invention. In this figure 1 and 2 denote two microphones each provided with a pre-amplifier 3 and 4 respectively. By a filter 5 a number of bands are suppressed from the frequency spectrum of the oscillations coming from the microphone 1; those bands of the oscil-

lations coming from the microphone 2, which are complementary to the first-mentioned bands are suppressed by a filter 6.

The output circuits of the filters 5 and 6 are connected in parallel and in a channel 7, which is connected to a modulated transmitter 8 of usual construction there consequently occurs again the complete frequency spectrum. The wireless connection between the transmitter and the receiver is denoted by 9. The oscillations emitted are received and demodulated in a radio-receiver 10 and the demodulated oscillations are supplied to a channel 11 in which consequently occur the same oscillations as in the channel 7. The channel 11 is connected to filters 12 and 13 which cut out the same bands as did the filters 5 and 6 respectively so that to the conductors 15 and 16 respectively is supplied a frequency spectrum which corresponds to the frequency spectrum in the output circuit of the filter 5 or 6 respectively. To the conductors 15 and 16 are connected loudspeakers 17 and 18 which convert the mutually complementary frequency bands passed by the filters 12 and 13 into sound waves.

One practical example according to the invention for the direct stereophonic transmission of sound oscillations is also shown in Fig. 1; in this case, for example, 8 and 10 are line amplifiers which are connected to one another by a transmission line 9.

One practical example according to the invention for the stereophonic recording of sound oscillations is represented in Fig. 2 wherein the same numerals denote similar components as in Fig. 1. The recording apparatus is diagrammatically denoted by 19.

One practical example according to the invention for the stereophonic scanning of sound oscillations which have been recorded with the aid of a device as is diagrammatically shown in Fig. 2, is represented in Fig. 3. Here again the same numerals denote similar components as in Fig. 1. The scanning device itself is diagrammatically represented by 20.

Under certain conditions the microphone amplifiers 3 and 4 of Figs. 1 and 2 may be dispensed with. Besides, the equipment for reproduction may be realised in such manner that power amplifiers are connected behind the filters 12 and 13 respectively. The latter may be useful, for example, in those cases wherein a large final energy is desired. In this case the filters 12 and 13 are arranged between a common pre-amplifier and the power amplifiers, owing to which the construction of the filters may be taken much lighter and therefore cheaper.

In order to elucidate the operation of the above-described devices Fig. 4 shows at A the frequency spectrum passed by the filter 5; *a* denotes the suppressed frequency bands. B represents the frequency spectrum passed by the filter 6, wherein *b* denotes the suppressed frequency bands. It will be clear that the passed frequency bands in A and B are complementary so that if these bands are added again the complete initial spectrum is obtained.

If in the reproduction the oscillations are separated again by the filters 12 and 13 according to the frequency bands shown in Fig. 4 A and B are then supplied to the loudspeakers 17 and 18, the loudspeaker 17 substantially reproduces only sound oscillations coming from microphone 1 and the loudspeaker 18 only sound oscillations coming from microphone 2.

It is true that neither the loudspeaker 17 nor the loudspeaker 18 do reproduce all the frequencies but together they do so and in practice it has been found that if the bands of A and B are chosen with some deliberation a very satisfactory stereophonic reproduction is obtained. This applies both to direct transmission via line or wireless and for the case wherein a recording equipment such as a talking film or a gramophone record is interposed.

In one embodiment, which yields satisfactory results in practice and which will be explained with reference to Fig. 5, the sound spectrum was divided into octaves and each octave again into three bands which were divided over the two channels. Since the lowest tones up to 250 cycles per second slightly contribute to the stereophonic effect, as do the highest tones, they may each be supplied without any objection to one particular loudspeaker for low and high tones respectively so that now four loudspeakers are utilized, viz. a loudspeaker 25 for the lowest frequencies up to 250 cycles per second, two loudspeakers 26 and 27 respectively for the mutually complementary bands in the range of from 250 to 4000 cycles per second and a loudspeaker 28 for frequencies exceeding 4000 cycles per second. The division of the frequency bands in the range of from 250 to 4000 c. p. s. was as follows:

Bands with loudsp. 26	Bands with loudsp. 27
C. p. s.	*C. p. s.*
250–315	315–397
397–500	500–630
630–794	794–1000
1000–1260	1260–1588
1588–2000	2000–2520
2520–3175	3175–4000

Fig. 5 represents furthermore at 20, for example, a scanning device with a pre-amplifier, 11 is a channel leading to filters 19, 12, 13 and 29, of which the filter 19 only passes the frequencies up to 250 c. p. s. and is connected to the loudspeaker 25 for low tones; the filter 12 passes frequency bands according to A in Fig. 4 and is connected to the loudspeaker 26; the filter 13 passes bands of frequencies according to B in Fig. 4 and is connected to the loudspeaker 27 whilst the filter 29 only passes frequencies exceeding 4000 c. p. s. and is connected to the loudspeaker 28.

A favourable attendant circumstance of sound transmissions or sound records realized with the aid of devices according to the invention is that the reproduction thereof with the aid of an equipment not designed for stereophonic reproduction is directly possible. It is true that in this case there occurs no stereophonic effect but for the rest the sound reproduced is completely normal so that it is not absolutely necessary to listen to stereophonic transmissions with a stereophonic reproducing installation.

By adding appropriate filters and an additional loudspeaker an existing reproducing installation may be directly made suitable for stereophonic reproduction according to the invention.

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PUBLISHED

MAY 18, 1943.

BY A. P. C.

K. DE BOER ET AL

DEVICE FOR THE STEREOPHONIC REGISTRATION, TRANSMISSION AND REPRODUCTION OF SOUNDS

Filed July 8, 1941

Serial No. 401,528

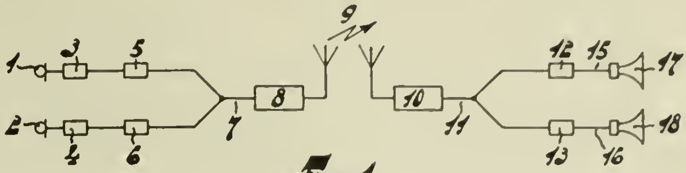

Fig. 1.

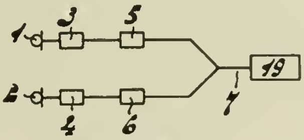

Fig. 2.

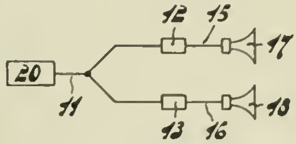

Fig. 3.

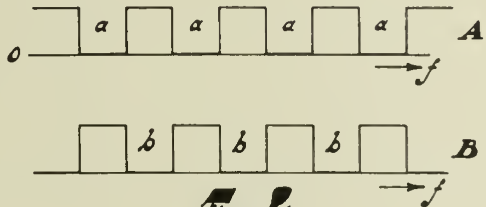

Fig. 4.

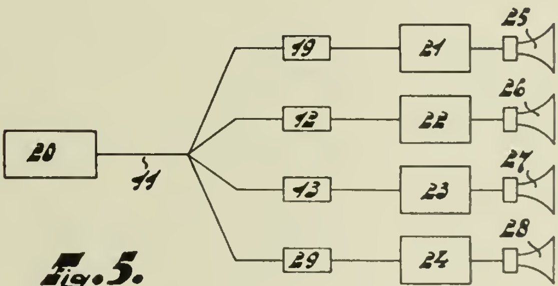

Fig. 5.

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ALIEN PROPERTY CUSTODIAN

ARRANGEMENT AND A METHOD FOR PROTECTING CIRCUIT BREAKERS

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Application filed July 10, 1941

This invention relates to an arrangement and a method for protecting circuit breakers, particularly relay contacts.

Relay contacts and many other contacts for switch gears are liable of being damaged by the current, particularly when being inserted in the circuit. The passage from the open to the closed position, during which the resistance of the contact has become sufficiently small in order to withstand the current occurring at the contact is not effected suddenly, but gradually. Consequently, if the current increases very rapidly upon the closing of the circuit as, for instance, occurs when switching in direct current or alternating current at a moment lying in the neighborhood of a maximum value of the current curve, the first sharp contact points evaporate. A metallic vapor arc is formed, by means of which a "floating" of the contact may under circumstances occur, thus causing a considerable wandering of the material and under circumstances a welding of the contact. The circumstances are still worse, if the contact arrangement vibrates as occurs mostly always with relay contacts, i. e., if the contact is lifted once more or several times before attaining the closed position. During this time a consumption of the contacts is not only caused by the corresponding switching-in operation, but also by the switching-off operation if the current has become sufficiently high during this time. In the case of perfect contact arrangements all disturbing effects described above are avoided after a period of one millisecond or less.

The invention is based on this fact. The object of the invention is to provide means for protecting contacts which are operated at undetermined moments, by which means the current is limited to such a low value during the period of a possible deterioration of the contact as not to be detrimental, these means being caused to be actuated automatically in accordance with the switching operation which begins at a moment impossible to be predetermined.

A possibility of carrying the invention into practice consists in the fact that a reactor of the known type having a closed iron core is in series with the contact and is brought into a predetermined state of magnetization before the beginning of the switching operation.

Fig. 1 shows the magnetization curve of a reactor with closed iron core. If as shown in Fig. 2 the reactor D is arranged in series with the circuit breaker S in the circuit of any device, resistance Z or the like, the magnetization curve of the reactor D shown in dotted lines varies when switching in the circuit breaker S from 0 (Fig. 1) up to the state of saturation in the case of correspondingly high current values owing to the current i brought about by the motive voltage u. Owing to the steep slope of the magnetization curve, the resistance of the reactor is at first, i. e. before the state of saturation is reached, very high so that the value of the current i immediately after the switching-in remains very low for a corresponding period, for instance, about a millisecond and may only thereafter vary in such a manner as it would do without the reactor. By suitably dimensioning the reactor a flattening of the current curve may be brought about at the beginning of the flow of the current in such a manner that the circuit breaker S is sufficiently protected against damages by the current switched in.

If the circuit breaker S is again opened and therefore the current i reassumes the value 0, the value of the current flowing through the reactor varies only slightly owing to the high remanence in the iron core of the reactor; the reactor remains in the state of magnetization A. This is, as a rule, undesirable, since when the circuit breaker S is again closed only a considerably flatter saturation curve (shown in dotted lines) is attained which begins at the point A, so that during the second and all following switching-in operations of the circuit breaker S the desired flattening of the current curve is no longer attained. This difficulty may be removed by the fact that a suitable state of magnetization is brought about by special measures before the beginning of a new switching operation, from which state a sufficient steepness of the magnetization curve is ensured up to the state of saturation during the following switching operation.

This may, for instance, be brought about by changing over the connections of the reactor between every two switching-in operations. The reactor winding is therefore connected substantially as is schematically shown in Fig. 3 with the circuit to be interrupted through change-over switches x, y. These change-over switches may be coupled in a suitable manner with the circuit breaker S or may be controlled under circumstances electrically in accordance with the circuit breaker. If the reactor is then changed over after or during the reopening of the circuit breaker, the magnetization curve as regards the effect of the reactor is rotated 180° while retaining the state of magnetization present at this moment or in other words the starting point for

the saturation is not the point A when the circuit breaker is again closed, but the point A' of the magnetization curve. A sufficiently steep saturation curve is therefore again easily attained in order to flatten the current in a sufficient manner when switching in the circuit breaker. However, this arrangement and this method can be employed for direct-current circuits only, but not for alternating-current circuits, since in the case of an incidental switching-in of the current within the range of a negative half cycle the same drawback is again presented which should be avoided by the changing over of the connections of the reactor.

Another method of attaining a suitable state of magnetization at the beginning of the switching operation for direct-current circuits is shown in Fig. 4. Here the reactor is negatively saturated by an auxiliary direct current i_v supplied by a voltage source E which is connected through a particular impedance J to an auxiliary winding of the reactor D. This auxiliary direct current maintains the reactor with the circuit breaker S open in a predetermined state of saturation B which may be chosen in the neighborhood of the negative state of saturation (Fig. 1). Upon the closing of the circuit breaker S, the saturation curve varies beginning from the point B as shown in dotted lines so that also the desired steepness of the magnetization curve is ensured.

In most cases it will also be sufficient to connect the auxiliary winding of the reactor only instantaneously and not permanently to the auxiliary voltage by means of an auxiliary circuit breaker *s* arranged in the auxiliary circuit. The starting point for the magnetization curve is then the point B' after the reopening of the auxiliary circuit breaker *s*.

Fig. 5 shows a form of the invention for direct-current circuits also in which the reactor is negatively saturated after the reopening of the circuit breaker S by an aperiodical discharge surge of a capacitor C which is charged by any suitable separate current source (not shown) and which may be connected by closing an auxiliary circuit breaker *s* to the auxiliary winding of the reactor D, preferably also through a particular impedance or a resistance R.

Fig. 6 shows a connection in which the current consuming device Z is supplied with energy through the circuit breaker S and the reactor D from a condenser K which is charged, for instance, by a current source (not shown). In this case the desaturation or the negative saturation of the reactor D is effected after the reopening of the circuit breaker S by means of a surge serving to charge the condenser K and which is supplied by a direct-current source, for instance, by a rectifier G. The latter is preferably inserted together with a sufficiently large damping resistance R' in the same circuit in order that the current consuming device Z is not prevented from being supplied with energy by the condenser K.

A further form of the invention which may be employed not only for direct-current circuits, but also for alternating-current circuits consists in the fact that the reactor after the reopening of the circuit breaker to be protected becomes desaturated by the periodically fading discharge current of a condenser. For this purpose, the same connection may be employed as shown in Fig. 5, except that the total resistance of the auxiliary circuit must be so dimensioned and tuned with the condenser C that the discharge fades out periodically, thus causing the state of magnetization of the reactor to traverse the hysteresis loop several times during the discharge of the condenser C, the state of magnetization finally assuming the value 0 or a value lying in the neighborhood of 0, insofar as the amplitude of the current decreases constantly. The reactor is then again ready to operate in both directions; i. e., the desired steepness of the saturation curve is ensured irrespective of whether the current is positive or negative at the moment when the switching-in operation occurs. Consequently, such a connection may not only be employed for direct current, but also for alternating current.

However, in contradistinction thereto connections in which the reactor not only becomes desaturated before the beginning of the new switching operation, but becomes saturated according to the polarity opposite to the momentary value of the current during the switching operation (negative in the case of a positive momentary value of the current) have the advantage in that the reactor may be utilized in a particularly favorable manner.

A form of the invention suitable for alternating-current circuits is shown in Fig. 7. Here the reactor D has an auxiliary winding which is biased by an alternating current of equal frequency as the motive voltage of the circuit to be closed, but of opposite phase with respect to the motive voltage. Fig. 8 shows the variation of the motive voltage u and the auxiliary exciting current i_v with time. If the circuit breaker S is closed at any moment, the reactor is preexcited according to the polarity opposite to the corresponding momentary value of the motive voltage. When the momentary value of the motive voltage and of the auxiliary exciting current is zero the reactor is, however, in an undetermined state as to the relation between the state of magnetization and the polarity of the motive voltage, whereas in the case of switching operations which commence, for instance, incidently in this moment or in the neighborhood thereof, the stress of the circuit breaker brought about by the current is also very small, since the motive voltage is approximately zero.

According to another form of the invention it is possible to attain with an alternating current at any moment of phase a pre-excitation of the reactor in a negative direction with respect to the corresponding value of the motive voltage. This is shown in Figs. 9 and 10. As shown in the connection in Fig. 9 an auxiliary reactor H is arranged in the auxiliary circuit. The curve of the auxiliary current i_v (Fig. 10) is distorted by the auxiliary reactor H in the manner that it is considerably flattened when the current passes each time the zero value. By correspondingly arranging additional impedances J (inductances, capacities) in the auxiliary circuit the mutual position of phase between the motive voltage u and the auxiliary current i_v (Fig. 10) may be so chosen that the reactor D whose hysteresis loop is shown at the left side of Fig. 10 is negatively pre-excited at each moment with respect to the momentary value of the motive voltage.

The possibilities of carrying out the invention are by no means limited to the forms of invention described above. The above forms of the invention may be employed to advantage separately and jointly or in any combination in any type of switch devices.

Thus, for instance, Fig. 11 shows a simplifica-

tion of the arrangement shown in Fig. 3. Here the reactor D is provided with two windings connected in opposition or with a single winding having a tapping in the center thereof. The two-pole change-over switch x, y of Fig. 3 is combined with the circuit breaker S to form a single circuit breaker. To close the circuit, the circuit breaker S is moved in the upward or in the downward direction. By such a periodical switching-in, the reactor as will easily be apparent is biased in the proper direction so that upon each switching in of the circuit breaker the point A′ of the magnetization curve according to Fig. 1 is the starting point for the saturation.

MARCEL ZÜHLKE.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

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ARRANGEMENT AND A METHOD FOR PROTECTING
CIRCUIT BREAKERS
Filed July 10, 1941

Serial No.
401,786

2 Sheets-Sheet 1

Fig. 1

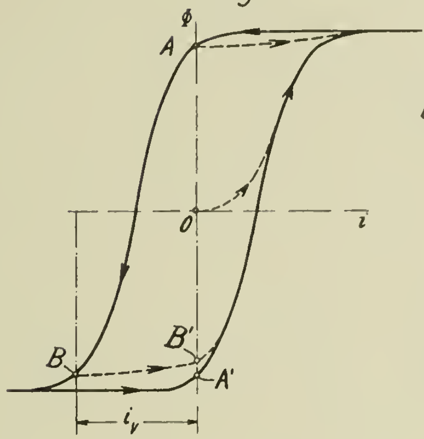


Fig. 2

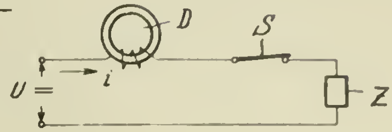


Fig. 3

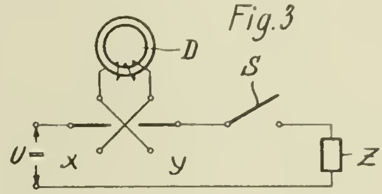


Fig. 4

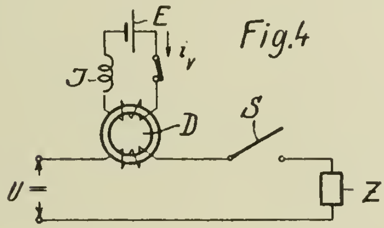


Fig. 5

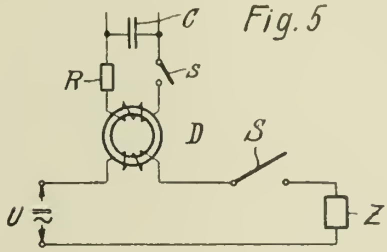


Fig. 6

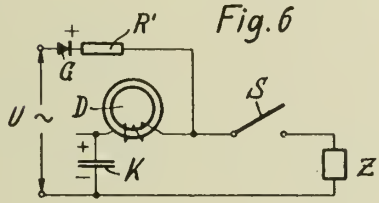


Fig. 7

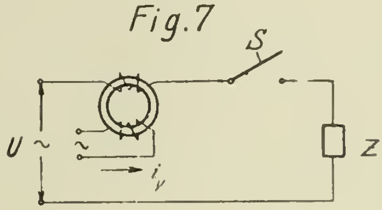


Fig. 9

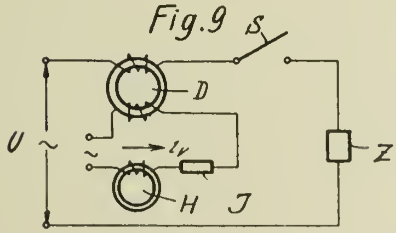
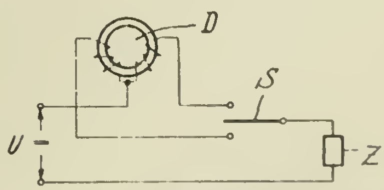


Fig. 11



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BY A. P. C.

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ARRANGEMENT AND A METHOD FOR PROTECTING CIRCUIT BREAKERS

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2 Sheets-Sheet 2

Fig. 8

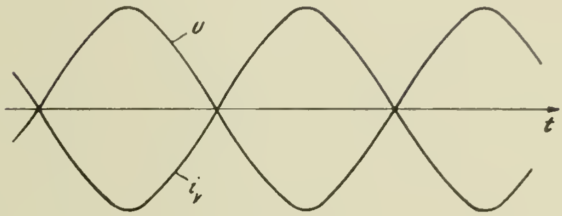
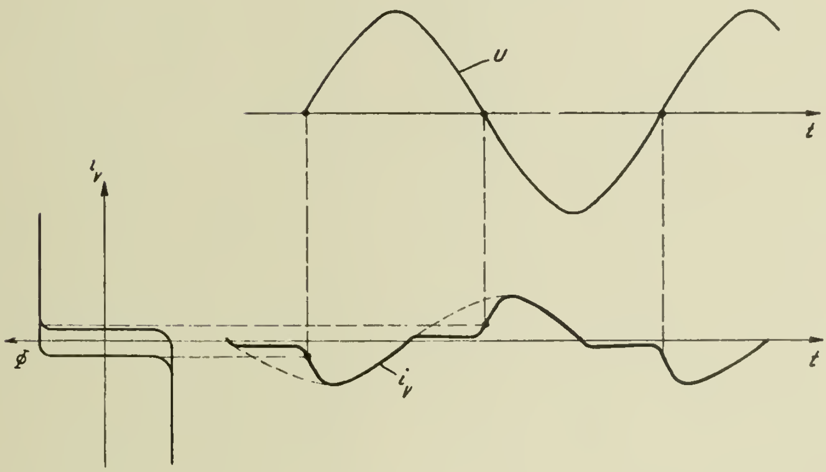


Fig. 10



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Published May 18, 1943

Serial No. 401,787

ALIEN PROPERTY CUSTODIAN

COMMUTATOR DEVICES

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Application filed July 10, 1941

This invention relates to improvements in commutator devices.

It is well known in the art to collect with the aid of commutators in electric machines and similar devices the current induced within a winding revolving relatively with respect to a magnetic field, such a commutator consisting, as a rule, of a series of insulated segments arranged in juxtaposition and cooperating with brushes moved with respect to the commutator. Such devices are employed for collecting currents produced, for supplying electrical energy to electric machines and also for converting purposes. In such commutator machines, the commutation which represents in most cases a short-circuiting of at least part circuits presents difficulties, for the removal of which a variety of methods have been proposed. Thus, for instance, it has been proposed to design the brushes with a relatively high resistance; furthermore, it is known to insert between the individual segments of the commutator resistances, for instance, in the form of reactors; moreover it has been proposed to subdivide the brushes themselves in individual brushes arranged in juxtaposition which in turn are connected to one another through ohmic, inductive, capacitive or combined resistances. Finally, it has also been proposed to allot to a machine with an armature two separate commutators, these two commutators being, for instance, arranged at different sides of the armature, in which case the conducting segments of both commutators are connected to the winding connections in such a manner that these connections alternately lead to the two commutators. In the case of rotary converters of this type, it has, furthermore, been proposed to connect the corresponding brushes of the two commutators with one another to a common current supply conductor by the insertion of means which permit the passage of the current only in one direction.

According to the present invention the machines and devices of this type may be considerably improved by inserting reactors with magnetic return in the commutating circuit, and more precisely to a particular advantage in the outer connecting conductor of such commutators cooperating with one another, the reactors being so dimensioned that they become already saturated in the case of relatively low currents (small fractions of, for instance, $\frac{1}{10}$ to $\frac{1}{10{,}000}$ of the normal currents).

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form. 1 denotes the continuous winding of the machine to which are alternately connected two groups of tappings 2 and 3, the group 2 leading to a commutator 4 and the group 3 to a commutator 5. In this case the commutators consist of conducting segments 6 between which may be arranged by the insertion of insulation further auxiliary segments 7 which are connected with the aid of resistances 8 to the main segment and between which are arranged further segments 9 of insulating material. In contact with the commutator 4 is a brush 10, and with the commutator 5 a brush 11 which are connected with one another and to the terminal 14 of the machine with the aid of conductors extending through reactors 12 and 13. In this case the commutator groups are displaced with respect to one another in such a manner that the individual commutators operate alternately.

During the commutation the current flows as in the case of ordinary commutators at first from the corresponding tap of the winding to the terminal 14 of the machine through the segments of the commutator, the corresponding brushes 10 and 11 respectively and through the reactors 12 and 13 so that the reactor becomes saturated, i. e., practically without resistance. As soon as the brush leaves the corresponding segment, the corresponding segment of the other commutator comes into contact with the brush so that the current must be displaced from one branch to the other. Since such a displacement opposes the inductance of the total circuit, a commutating voltage is necessary which may be impressed on the circuit consisting of the winding portion, brushes, reactors and connecting conductor, for instance, with the aid of a commutating field which may be produced in a known manner by interpoles. The variation of the main field as well as of the commutating field is shown schematically in Fig. 1 above the winding. As soon as the current during the commutation falls below a predetermined value, for instance, 1 Amp. or 0.5 Amp., the corresponding reactor becomes desaturated so that its inductive resistance is fully effective, which retards a further change in current and thus maintains the current during a predetermined period at a very low value. In this manner it is not necessary to give the commutating voltage the exact value, which in some cases may be difficult, particularly in machines which operate with different loads, but the commutating voltage may be given a relatively high value, since the current during the commutation is kept at such a low value for a sufficiently

long period that the commutation may take place at the contact brushes without detrimental arcing and without recurring to the equalizing effect of the resistance carbons, of which the contact brushes may, for instance, consist.

For the above reason it is also possible according to the invention to employ brushes of highly conductive material such as copper or silver instead of the resistance brushes or to employ metallic lifting contacts consisting, for instance, of silver instead of rotating contacts, whereby the voltage drop at the brush contacts may be reduced to a minimum, which enables a considerable increase in efficiency.

Furthermore, a path parallel to the circuit breaking devices and consisting of ohmic or capacitive resistances may be employed to a particular advantage in preventing the production of overvoltages as is described in detail in the copending application Serial Nr. 114,965, filed December 9, 1936.

In this case the parallel path consists to advantage chiefly of capacitive resistances and may receive a small ohmic component in the case of an attenuation being necessary.

It is also possible according to the invention to design the reactor with a magnetic bias as shown in Fig. 2. In this figure also the second contact device of the same type is shown as, for instance, the negative terminal in the case of a direct-current machine. The winding together with the segments is closed so that it comes successively into engagement, for instance, at two opposite points with the two contact devices.

Furthermore, it is also possible according to the invention to bring out the production of the commutating voltage of the machine by impressing the necessary voltage on the circuit in the zone outside the brushes. This may, for instance, be effected with the aid of a commutation transformer which must be inserted at any point of the following circuit: Brush, connecting conductor, first reactor, second reactor, connecting conductor and the opposite brush. In this manner, it is possible to design the entire commutating device in the form of a stationary unit, in which case it is only necessary to introduce the commutating voltage in accordance with the operating rhythm of the single switch devices or segments.

To produce the commutation voltage a special machine, a commutator machine, may be employed according to the invention by which a commutating voltage facilitating the changing over from one group to the other and of a corresponding magnitude and position of phase is produced with the frequency of the switching operation, with which the reactors already saturated by relatively low currents lie in series, which may under circumstances be connected in parallel relation with variable capacitive or ohmic resistances. This commutator machine is preferably designed in the form of a high-frequency machine which possesses an exciting winding traversed by the current taken from the switch segments and arranged in the stator, for instance, as a concentrated winding.

For instance, a frequency changer designed according to the invention renders possible the conversion of a single-phase current or three-phase current of a given frequency in alternating current or three-phase current of a frequency controllable at will, in which case a simple controllability and great outputs may be attained. By the commutating device according to the invention it is also possible to attain a considerable improvement in the commutation of three-phase commutator machines and single-phase traction motors, since in the three-phase commutator machines the usual interpoles cannot be employed. The outputs of these machines are therefore limited. It is true that the stator excited three-phase commutator machines enable the use of interpoles, but they cannot be employed for considerable regulating ranges and high frequencies.

Since it is practically hardly possible to always introduce the commutating voltage of such a magnitude that the current upon the brush leaving the switch segment becomes zero, a somewhat greater commutation voltage is preferably impressed and the excess of voltage is absorbed in a commutation reactor when the current passes the zero value. It is thus possible to extend the zone within which the current obtains the zero value and to prevent a flow of the current when the brushes leave the segment. However, the commutation reactors are necessary for other reasons, since in the armature coils short-circuited during the commutation electromotive forces of transformation which must also be taken up by the reactors are produced by the rotating field in order to reduce the short-circuit currents to a minimum caused by these voltages of transformation. Furthermore, when employing a smaller number of switch segments, the voltage surges must be taken into consideration which occur when passing from one segment to the other. Only by the use of commutation reactors in commutator machines it is therefore possible to carry the arrangement into practice, since the commutation reactors permit to introduce a considerable greater commutating voltage than is necessary for causing a passage of the current from one segment to the other and to absorb the excess voltage when the current passes through the zero value so that the equalizing current is prevented from being increased again until the brush has left the segment. The size of the reactor depends upon the magnitude of the voltage which the reactor must absorb when the current passes through the zero value. For this reason, the commutating voltage should not be chosen too high, since the reactors must furthermore take up the voltage of transformation and in the case of a small number of switch segments also the commutating voltage. This natural commutation voltage cannot be utilized to cause the current to pass through the zero value, since it may occur that in the case of a given slip it does not lie properly in the ascending portion of the sinusoidal half waves produced, whereas in the descending portion it does. The following segment must, however, possess always the higher voltage when passing from a segment to the other.

In Fig. 3 of the accompanying drawings the invention is shown in a diagrammatic form, i. e., an arrangement for a frequency transformer as may be employed in static frequency changer connection also in the case of three-phase commutator machines and in converters. The frequency transformer has an armature winding A whose connections of uneven number are connected to the left-hand commutator K_1. Each commutator has as many switch segments as the number of connections of the armature winding so that every second segment is connected. In this case the width of the brush should not be greater than that of a segment not connected

lying between commutator segments connected to the winding. In order not to obtain too narrow brushes, the number of segments may be chosen greater than that of the winding connections and the width of the current carrying segments and of the segment not connected and lying therebetween may be adjusted by connecting various segments. The supply of the three-phase current of constant frequency is effected through three slip rings S connected to three taps of the armature windings, displaced 120 electrical degrees, i. e., in a similar manner as in the known frequency transformers for rotary converters. The stator of the frequency transformer has no winding. It forms only the magnetic return for a rotor field. The drive of the armature is effected through a small controllable motor M whose output is determined by the friction of the frequency transformer caused by air, bearings and the commutator.

The drive may be effected in a subsynchronous or a hypersynchronous manner, preferably the drive is to be effected in a hypersynchronous manner in order to avoid that the maximum frequency, for instance, 50 cycles in the case of a stationary armature must be supplied. In the case of a hypersynchronous drive direct current is supplied in synchronism and in double synchronism the frequency. All frequencies between 0 and the maximum frequency, for instance, 50 cycles are to be obtained. The control of the voltage supplied to the commutator is effected by shifting the brushes.

Between the brushes K_1 and K_2 are inserted the commutation transformers KT_1 and KT_2 whose primary winding is excited by the commutator machine KM. The latter has a running winding II arranged in the grooves of the stator laminations as is the case with high-frequency machines designed in the form of homopolar generators. The rotor Z is designed in the form of a gear whose number of teeth is determined by the commutating frequency and the number of segments respectively. It is driven at the same speed as the frequency transformer. The exciting winding I of the commutator machine which is, for instance, arranged as a concentrated winding in the stator laminations is excited by the current of the variable frequency produced. The commutator machine is substantially dimensioned for the segment output, i. e., for the product: Commutating voltage multiplied by the maximum current flowing through the brushes.

In the path of the short-circuit current between the brushes K_1 and K_2 are furthermore inserted the commutation reactors KD which have the function to take up the voltage of transformation and the excess commutating voltage when the current passes the zero value. The reactors must be so dimensioned that they are desaturated in the case of small currents, for instance, of currents smaller than 1 Amp. and that they are capable of taking up all voltages occurring in the path of short-circuit current. In the case of currents greater than 1 Amp. they must be saturated as far as possible.

The above described commutating device may be employed in three-phase commutator machines, single-phase traction motors are in direct-current commutator machines. Furthermore, they may be employed to advantage in frequency transformers which operate on the converter system and enable a continuous regulation of the frequency free of loss. With such a device a six- or twelve-phase transformer would operate through two commutators or through two controlled switch devices, the drive being effected in accordance with the desired frequency. The above-described device may also be employed in the usual static frequency changers with tubes.

As a further improvement the commutating voltage may be chosen in a manner proportional to the main field and be so supplied that it counteracts the voltage of transformation. The arrangement becomes very simple, if the primary winding of the transformer is connected in parallel relation to the exciting winding. Also the interpoles may be omitted and a commutating voltage produced outside the machine, preferably by means of a particular commutator machine may be connected in series with the countervoltage. The omission of the interpoles enables a very good utilization of the space so that machines of equal output are of smaller dimensions than the hitherto known.

In Fig. 4 is shown, for instance, the wiring diagram of a single-phase traction motor designed according to the invention. In this case, the voltage of transformation is compensated according to the invention by a countervoltage inserted in the commutation circuit through an auxiliary transformer T. To this end, the armature A of the single-phase traction motor receives two commutators K_1 and K_2. The winding tappings of even number 2, 4, 6 . . . . of the armature winding A are, for instance, connected to the right-hand commutator K_2 and the winding tappings of an odd 1, 3, 5 . . . are connected to the left-hand commutator K_1. Each commutator is preferably provided with at least as many segments as there are winding tappings so that every second segment is connected. Between the brushes connected to the same connecting conductor and sliding on the two commutators is inserted an auxiliary transformer T whose primary winding is connected to a voltage which is proportional to the voltage of the exciting winding E. To this end, the primary winding is connected in parallel relation to the exciting winding; it is thus possible to compensate the voltage of transformation. In this case, the commutator voltage is, for instance, produced by interpoles. The compensation winding is denoted by the reference character K. However, the voltage of transformation may be rendered at least in part ineffective in another manner. To this end, reactors D are inserted in the commutation circuit and are so designed that they are already saturated by very small currents, for instance, smaller than 1 Amp. They must be so dimensioned that the voltage induced by the main field in the short-circuited coil is not sufficient to saturate the reactors; however, by superposing the commutation voltage produced by the interpoles the reactors become saturated and represent for the commutation itself only a small additional resistance. When the brushes leave the commutator segment the current is reduced to the zero value by the commutating voltage produced by the interpoles in the short-circuited armature coil and the voltage of transformation is neutralized. In this arrangement it is not necessary to accurately adjust the commutating voltage produced through the interpoles. Since the reactors D can take up the excess, the commutating voltage may be made greater than is theoretically necessary so that the current may pass with certainty from one segment to the other.

Furthermore, the interpoles are omitted ac-

cording to the invention and the commutating voltage is inserted from the outside through the auxiliary transformer T. To this end, the transformer T is excited with the aid of a voltage proportional to the armature current and which has the commutating frequency. In Fig. 5 is shown such an arrangement in which, however, the connections for the insertion of the voltage counteracting the voltage of transformation and proportional to the voltage of the exciting winding are not shown. The commutating voltage may be produced by a commutator machine KM which runs at the same speed as the traction motor. The commutator machine is, for instance, designed in the form of high-frequency machines. It has a gear Z as a rotor whose number of teeth is determined by the number of revolutions and the commutating frequency required. The product: number of teeth multiplied by the number of revolutions must be equal to the commutating frequency. The stator carries a concentrated exciting winding KW traversed by the armature current and a distributed running winding S in which a high-frequency voltage is produced which is impressed on the primary winding of the auxiliary transformer T as a commutating voltage. The commutating voltage thus produced may be connected in series with the voltage of the exciting winding E in order to insert in the commutating circuit through the auxiliary transformer T both the commutating voltage and the voltage for neutralizing the voltage of transformation. Here the commutation reactors D are preferably inserted in order that the commutating voltage must not be accurately tuned which is impressed through the auxiliary transformer T and which represents a high frequency modulated with the frequency produced. Preferably a greater commutating voltage is supplied and the excess is taken by the reactors D.

The reactors D may then also be so dimensioned that they render the voltage of transformation ineffective so that only the commutating voltage must be supplied through the auxiliary transformer T.

It may happen that owing to leakage, saturation etc. departures from the voltage of transformation and from the commutating voltage occur. However, these departures may be taken up by reactors, whereby the commutation becomes perfect.

According to a further improvement the reactors provided with a magnetizable core may be so dimensioned that the voltage of transformation alone induced in the corresponding short-circuited armature winding by the exciting field of the machine does not suffice to saturate the reactors, but the reactors become saturated by the superposition of the commutator voltage produced by the interpoles. In this case the interpoles may be omitted and the commutating voltage may be inserted from the outside preferably through the transformer between every two brushes connected to the same connecting conductor. In this manner, it is possible to utilize the space to a greater extent when designing the machine.

The improvement will be made evident in connection with the Figs. 4 and 5 of the accompanying drawings. The armature A (for instance, of a single-phase traction motor) has two commutators K_1 and K_2. In this case the winding tappings of even number **2**, **4**, **6** . . . of the armature winding A are, for instance, connected to the right-hand commutator K_2 and the winding tappings of odd number **1**, **3**, **5** . . . to the left-hand commutator K_1. Each commutator receives preferably at least as many segments as there are winding tappings so that every second segment is connected. Between each brush on the one commutator and each brush connected to the same connecting conductor on the second commutator are inserted according to the invention reactors D provided with a magnetizable core which are so dimensioned that the voltage of transformation alone does not suffice to saturate the reactors but the reactors D become saturated, for instance, in the case of currents somewhat smaller than 1 Amp. by superposition of the commutating voltage. They then represent for the commutation itself only a small additional resistance. When the brush leaves the commutator segment the current is reduced to the zero value by the commutating voltage produced by the interpoles in the short-circuited armature coil and the voltage of transformation is neutralized. In this arrangement it is not necessary to accurately adjust the commutating voltage produced through the interpoles. To obtain with certainty the passage of current from one segment to the other the commutating voltage may be rendered greater than is theoretically required, since the reactors D may take up the excess of voltage.

The voltage of transformation may at least be neutralized in part also by a voltage proportional to the main field and inserted between every two brushes connected to the same connecting conductor. This voltage is inserted in the commutating circuit through an auxiliary transformer T. In this case the primary winding of the transformer is connected to a voltage proportional to the voltage of the exciting winding E. In this case the commutating voltage is produced by interpoles W. The compensation winding is denoted by the reference character K.

According to another embodiment of the invention the interpoles are omitted and the commutating voltage is inserted from the outside through the auxiliary transformer T. To this end, the transformer T is energized by a voltage proportional to the armature current and has the commutating frequency (Fig. 5). The commutating voltage may be produced by a commutator machine KM which runs at the same speed as the traction motor. It is designed, for instance, in the form of a high-frequency machine. It has as a rotor a gear Z, whose number of teeth is determined by the number of revolutions and the commutating frequency required. The stator carries a concentrated exciting winding KW traversed by the armature current and a distributed running winding S in which a high-frequency voltage is produced which is impressed on the primary winding of the auxiliary transformer T as commutating voltage. The commutating voltage thus produced may also be connected in series with the voltage of the exciting winding E in order that both the commutating voltage and the voltage for eliminating the voltage of transformation is inserted in the commutating circuit through the auxiliary transformer T. Here also commutation reactors D are preferably inserted in order that the commutating voltage which is impressed through the auxiliary transformer T and which represents a high-frequency voltage modulated with the frequency produced need not be accurately tuned. A greater commutating voltage is preferably inserted and the excessive voltage is taken up by the re-

actors D. The reactors D may as described above be then also so dimensioned that they render ineffective the voltage of transformation so that only the commutating voltage must be supplied through the auxiliary transformer T.

A particularly favorable form for the new type of machine is obtained if the energizing part as is known in the art is designed as a revolving part, whereas the armature is made stationary and the armature winding is connected to the switches for the commutation. If a commutating field winding or compensating winding is necessary, the latter may also be arranged in the rotor. In this case two switch groups are provided for each phase, one of which extends to the tappings of the armature winding of even number and the other to the tappings of the armature winding of odd number. In the connecting conductor between the switch groups is furthermore introduced at least a device for the sudden change in resistance at the point, for instance, before the point where the current passes the zero value during the commutation. The flattening of the current curve at the point where the current passes the zero value, which flattening is attained by the devices for a sudden change in resistance renders possible even the performance of relatively long lasting switching operations without arcing, since the current has practically the value zero not only within an indefinitely short time interval but for a definite period sufficient for the switching operation. In this case, the flattening of the current curve may be attained without complicated devices, since two switch groups are provided for each phase. In this manner, it is possible to reduce the number of devices for the sudden change in resistance to a minimum.

It is particularly advantageous to employ also in this case for the sudden change in resistance reactors saturated already under small currents, under circumstances, reactors biased with varying polarity which, for instance, may be connected in parallel relation, for instance, to a controllable capacitive or ohmic resistance. In this case, to improve the commutation, the reactors are preferably so dimensioned that the voltage of transformation alone induced in the corresponding portion of the armature winding by the exciting field is not sufficient to saturate the reactors but the reactors become saturated by the superposition of the commutating voltage. To eliminate the voltage of transformation also a voltage proportional to the exciting voltage and counteracting the voltage of transformation may be inserted preferably through a transformer in the connecting conductor between switch groups. It is also possible to design the device for suddenly changing the resistance of one-anode grid-controlled tubes in cross-connection.

The invention is shown in diagrammatic form in Fig. 6, and more precisely this figure shows a single-phase series motor, suitable particularly for electric traction and which does not possess any commutator in contradistinction to the otherwise usual types and which may be designed both for frequencies of 16⅔ cycles and for such of 50 cycles. The exciting winding E, the commutating field winding W and the compensating winding K are arranged in the revolving part, the current supply to the series-connected windings being effected through two slip rings S. The interpole parallel resistance, if necessary, may be arranged in the rotor and connected between a third slip ring which is to be dimensioned only for the interpole parallel current and a main slip ring. The three said windings may be designed as is the case with single-phase traction motors with salient poles or as distributed windings, in which case parts of the windings are to be switched over through an auxiliary slip ring upon the reversal of the direction of rotation.

The armature winding A is designed in the form of a closed direct-current winding and arranged in the stator. The tappings of odd number 1, 3, 5, 1′, 3′, 5′ of this winding lead to the switches k_1, k_3 and k_5 and k_1', k_3' and k_5' respectively and the windings of even number 2, 4, 6, 2′, 4′ and 6′ lead to the switches k_2, k_4, k_6 and k_2' k_4' and k_6' respectively. These switches are, for instance, controlled through cam shafts driven by the motor shaft. The switches k_1, k_3 and k_5, k_1', k_3' and k_5', k_2, k_4, k_6 and k_2', k_4' and k_6' are electrically connected to one another and lead to the commutating reactors D_1, D_2 and D_1', D_2' respectively, between which are connected the current supply leads. The armature winding is connected in series with the winding connected to the slip rings.

In the embodiment shown the current flows from the current supply I through a slip ring S, to the main pole winding, commutating pole winding and compensating winding, through the second slip ring S, the reactor D_1 and the switch k_1 to the tapping 1 of the armature winding. After the current has flown through the armature winding it then flows to the reactor D′ through the connection 1′ and the switch k_1 and finally to the current supply II. Under the influence of the torque resulting therefrom, the motor begins to rotate and the switches k_2 and k_2' are closed. Since the potential of the tapping 2 under the influence of the commutating field is greater than that of the tapping 1, the switches k_2 and k_2' effect the current supply. Owing to the particular dimensioning of the reactors which are already saturated under small currents, for instance, in the order of magnitude of 1 to 2 Amp., the zone where the fading out current passes the zero value is extended through the switches k_1 and k_1'. Furthermore, the unsaturated range of the reactors may be displaced at will, for instance, into a symmetrical position with respect to the point where the current passes the zero value by a magnetic bias preferably with direct current or with varying polarity. The opening of the switches is effected practically without flow of current, since only the magnetizing current of the reactors D_1 and D_1' must be switched off. The reactors therefore prevent the occurrence of short-circuit currents at the sides of the passage of the current from one switch to the other if both are inserted in the circuit.

The voltage of transformation induced in the short-circuited parts of the armature winding during the commutation under the influence of the exciting field may be rendered ineffective in this arrangement if the reactors are so dimensioned that they do not become saturated by the voltage of transformation alone but by superposing the commutating voltage. Out of phase commutating fields as are usual in the known single-phase traction motors may be then dispensed with. The voltage of transformation may also be counteracted in the reactor circuit by inserting in the reactor circuit a countervoltage proportional to the exciting voltage. This commutating voltage may be impressed through particular transformers which are connected to the points P_I, P_{II} and P_I', P_{II}' respectively. The voltage applied to the transformers is taken from the slip rings or the

main pole winding E. Under circumstances, the reactors may be biased with the aid of particular windings which are energized by a voltage proportional to the exciting voltage, parallel resistances being preferably provided for the adjustment of the proper position of phase. To obtain small commutating reactors and to increase the pause between the operations of the reactors instead of a single reactor behind the points P_I, P_{II}, P_I' and P_{II}' a reactor may be inserted in series with each switch in front of said point.

Instead of the commutating reactors also one anode grid controlled tubes may be employed as is shown in Fig. 7 also for a single-phase traction motor. In this case similar devices are denoted by the same reference character as in Fig. 1. Here each reactor is preferably displaced by two tubes v in cross section, the grids g being stressed through the switches k_1, k_2 or corresponding auxiliary contacts h on the cam shaft according to the desired flattening of the current curve by short positive voltage surges. In this case the grid control may be so effected that positive voltage surges of short duration are imparted through corresponding auxiliary contacts h to the grids of two cross-connected tubes shortly after the closure of the corresponding switches k_1, k_2 etc. In this case, that tube is energized whose anode voltage is positive with respect to the cathode, whereas the other tube remains deenergized. The switching on of the negative grid voltage is omitted in the figure, since it is effected in the usual manner.

The control of the speed is effected in the two arrangements shown in the same manner as in the case of the usual single-phase traction motors by varying the magnitude of the terminal voltage supplied.

The commutator device may be employed in other electric machines. It is preferably employed instead of the usual commutating apparatus with commutator, in machines which are designed according to the principle of the three-phase series motor, of the stator-fed and of the rotor-fed three-phase parallel motor. If in the usual types of said machines a double set of brushes had been necessary, now switch groups are employed to advantage in lieu thereof which possess an inner row of contacts i (Fig. 8) connected to the armature winding and two outer rows of contacts a connected to the field winding through slip rings or to the network through voltage regulators and which may be displaced with respect to the row i in dependence upon one another or independently of one another. The rows of contacts a may also be stationary, whereas the cams driving the same may be of the rotatable type. The displaceability of the outer rows of contact indicated by the arrows serves to cause a cooperation of the various outer and inner contacts. In this manner, a speed or torque control is attained by shifting the brushes as is the case with the known commutator machines.

The invention is not limited to the above-described embodiments. Thus, for instance, also the changing over between the various tappings of a step transformer may be effected in such a manner. The proposals of the invention may be employed to advantage also independently of one another separately, jointly or in any combination as well as in connection with those of the above copending application and the respective additional applications particularly with the proposals mentioned in the U. S. Patent No. 2,181,152. Thus, for instance, the resistances between main segments and segments may be of the ohmic, inductive, capacitive or of the combined type.

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4 Sheets-Sheet 1

Fig. 1

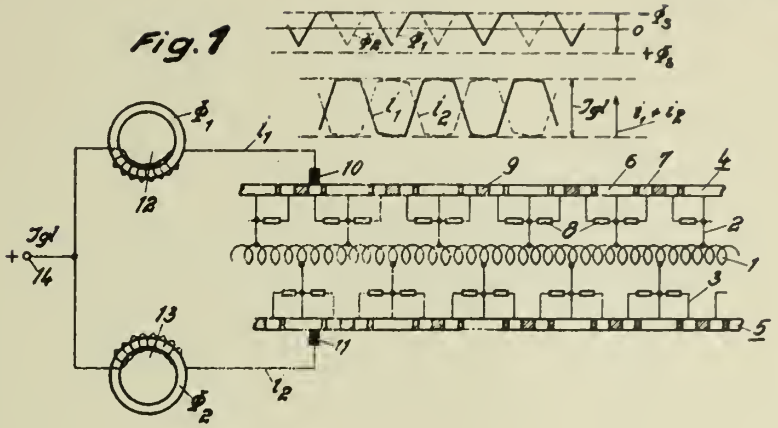

Fig. 2

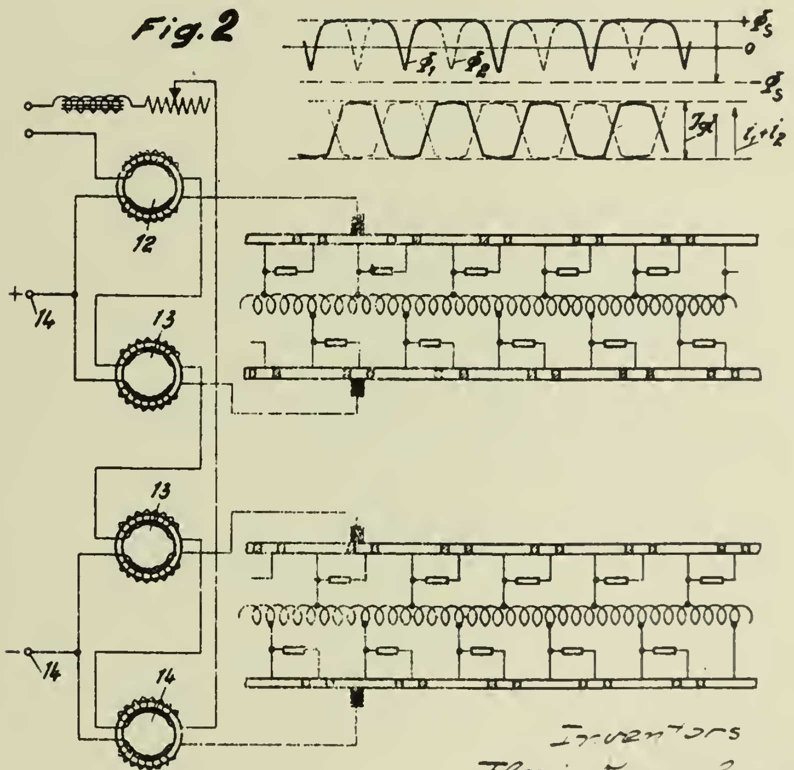

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Fig. 3

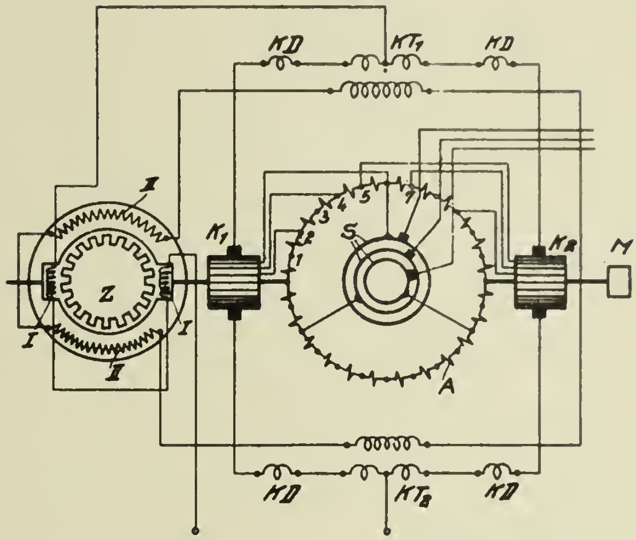

Fig. 6

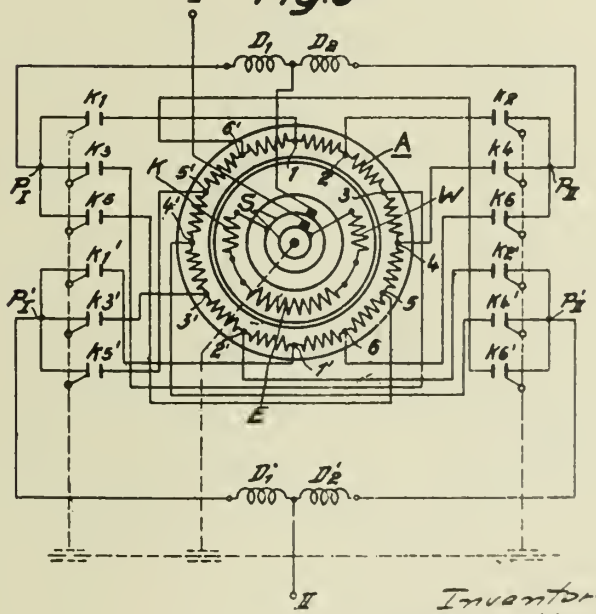

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Fig. 4

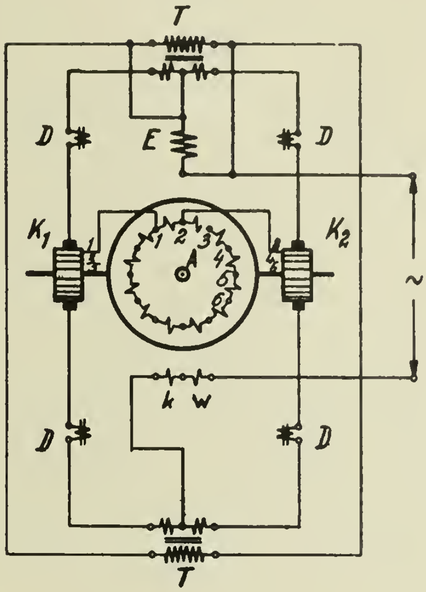

Fig. 5

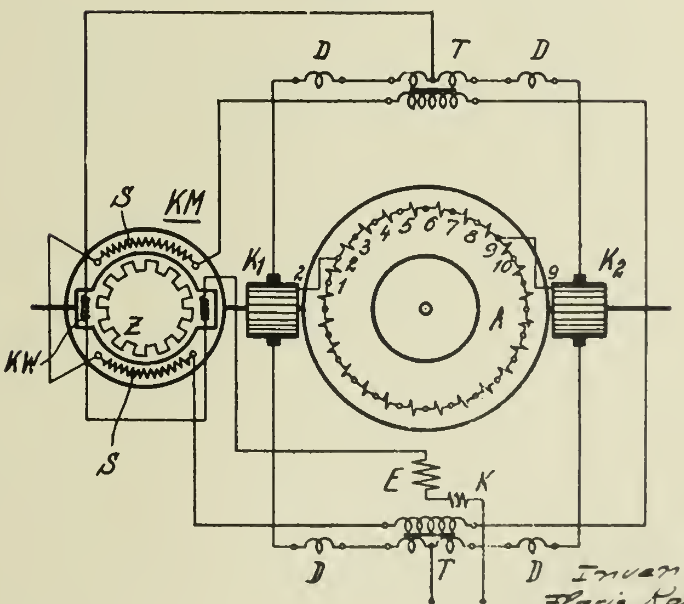

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Fig. 7

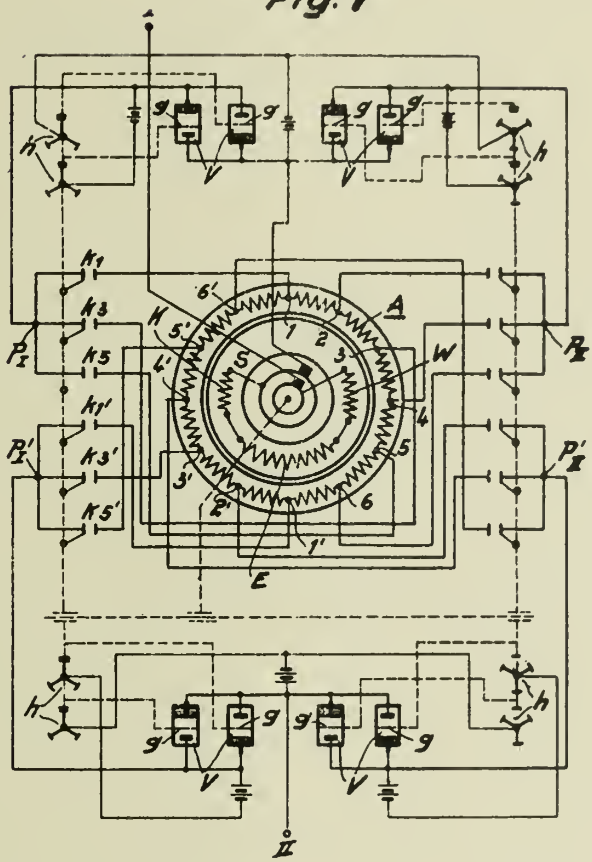
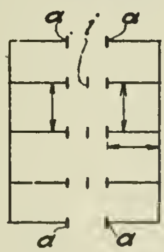


Fig. 8



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ALIEN PROPERTY CUSTODIAN

CLUTCH, ESPECIALLY FOR MOTOR CARS WITH CONTROL CHANGE MECHANISM

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Application filed July 11, 1941

There exist clutches consisting of the union of an one-disk clutch (additional clutch) with a lamellae clutch, one of the lamellae carriers of which (loose lamellae carrier) is rotatory supported with relation to the two shafts or the like which are to be coupled with one another. The construction is such that when the coupling procedure commences the loose lamellae carrier is first coupled with the shaft or the like concerned with the aid of the additional clutch, and only now the running clutch is operated, whereas, reversely thereto, when the clutch is to be disengaged first the running clutch and only thereafter the additional clutch is relieved, or opened respectively.

With clutches of this type the lamellae clutch runs preferably in oil or the like in order to secure a friction value which, although low, is nevertheless possibly constant, whereas the friction surfaces of the additional clutch must be prevented from coming in contact with the oil or the like. This is attained, according to the present invention, by an arrangement and combination of the parts concerned in which the additional clutch is liquid-tight separated from that part of the clutch casing which surrounds the lamellae clutch by means of diaphragms which connect on the one hand the pressure plates of the additional clutch with the thrust collar, and on the other hand this ring with the inner end of the loose lamellae carrier. That separating closure is preferably completed by a cuff connecting the hub part of the loose lamellae carrier with the adjusting collar and by an annular disk extending from the inner rim of the pressure plate of the additional clutch to the proximity of the shaft.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing on which is shown a preferred constructional form of a clutch intended to constitute an intermediate member between the motor and the shaft transmitting the power to the gearing. The figure shows an axial section through one half of the clutch, it being understood that the other half is of accurately the same design. This clutch is electromagnetically operated. I wish it, however, to be understood that my invention is not restricted to clutches of this type, but it can be advantageously employed in all cases in which a lamellae clutch is combined with a simple friction clutch and both are housed in a common casing.

Referring to the figure shown **1** denotes the fly disk of the motor which is connected with the motor shaft by a flange and connecting members such as **1**^{a} or the like. This disk **1** is so designed as to constitute the body of an electromagnet and is provided with two annular concentric grooves containing the coils **2**^{a} and **2**^{b}. The armature of the electromagnet is formed by an annular disk **3** serving at the same time as pressure plate for the additional clutch Z which is designed as an one-disk clutch. The friction disk **7** of this clutch is connected by means of a hub body **7**^{a} in such a manner with the shaft **6** transmitting the power to the gearing that it can rotate upon said shaft, but is not axially shiftable thereon. The friction disk **7** is in the usual manner provided on its outer rim with rings consisting of a material suited to produce friction, and opposite these rings are counter rings **3**^{a} and **8**^{a} cooperating with them and consisting of a sort of steel likewise suited to produce friction. The friction ring **3**^{a} is fastened to the armature **3** and the friction ring is fastened to the annular body **8** which serves on the one hand as a thrust block for the additional clutch Z and on the other hand as carrier for a plurality of springs **4** distributed around the circumference of the same and tending to secure the position of the armature disk **3** relatively to the friction disk **7**. The springs **4** are housed in pot-like recesses **8**^{b} of the annular body **8**; each thereof contacts at one end with the body of the respective recesses **8**^{b} and at the other end with the washer of a bolt **5**, the other end of which is secured to the armature disk **3**. This latter is guided in a rim-shaped extension **8**^{e} of the annular body and prevented by suitable means from rotating relatively thereto. The annular body is supported by the intermediary of its sleeve-like part **8**^{d} upon the loose lamellae carrier of the lamellae clutch L in such a manner, that it cannot rotate, but can be axially shifted upon i. This axial movement is limited in left-hand direction by means of an abutment member **1**^{b} provided at the fly disk **1**, the position being then such a one in which the armature disk **3** that is connected with the annular body **8** has not yet finished its stroke directed towards the electromagnet **2**.

The loose lamellae carrier **9** consists substantially of a hollow cylinder **9**^{a} provided in its interior in the usual manner with ledges distributed around the circumference of said lamellae which receive the one group (**10**) of the lamellae that are provided with suitably shaped and arranged rim grooves; further a disk body **9**^{b} and a sleeve like the hub body **9**^{c}. The loose lamellae

carrier is rotatory supported relatively to the motor shaft, as well as to the gearing shaft, said carrier being equipped for said purpose with ball bearings 11 housed in the sleeve-like part 12 of the clutch casing 13. This latter encloses the entire clutch device and is connected at 13^a with a rim-like projection 1^c of the fly disk 1. The casing 13 constitutes at the same time the other interior lamellae carrier 14 which carries the other group 15 of the lamellae.

The clutch levers 17 are supported at 16 at the exterior, loose lamellae carrier and extend with their inner ends 17^a through recesses 9^d provided in the hub part 9^e, where they are jointed to the adjusting collar 20 of the clutch which can be axially shifted in the usual manner by means of the clutch pedal of the car concerned by the intermediary of a clutch ring acting upon the right-hand end of said collar, this latter taking the inner ends of the levers 17 along with it. The levers 17 are connected with an annular body 23 by the intermediary of draw members 21 designed as screw bolts, the connection being such the body 23 is taken along with said members when the levers 17 are turned in clockwise direction by shifting of the collar 20 to the left, counter to the action of the springs 24 that are distributed around the circumference, the springs being supported at their lower ends by the disk-shaped part 9^b of the loose lamellae carrier 9. The draw bolts 21 have ball-shaped heads or correspondingly shaped bolts by the intermediary of which they are suspended in correspondingly shaped recesses of the clutch levers 17, or of the annular body 23 respectively.

Within the range of one of the clutch levers 17 or of the clutch pedal which the driver operates directly is a contact inserted into the circuit of the coils of the electromagnet 2^a 2^b and closed when the driver depresses the pedal.

The clutch casing is closed, except at the annular slot where there are the ball bearings 11; it is partly filled with oil serving to lubricate and cool the lamellae clutch. The oil is caused to circulate through a cooling device comprising the lamellae and ribbed pipes 28 situated outside the casing, the circulation being effected by means of scoop pipes 27 affixed to the loose lamellae carrier 9 and lifting the oil out of that part of the casing which encloses the annular body 8 and has there a larger radius, and the oil being then supplied to and into the casing through channels provided in the loose lamellae carrier and communicating with said scoop pipes by means of branches 30. The oil flows then further through slots 14^a provided in the stationary lamellae carrier 14 and passes through between the lamellae and through slots 25, or 26 respectively, into the space 32 within the casing, from which it finally flows back into the space 29 through the ribbed pipes mentioned.

In order to hold the oil off from the additional clutch 2, this latter is separated from the space enclosing said clutch in a liquid-tight manner. This is effected in the constructional form shown by way of example on the one hand with the aid of two diaphragms 23 and 24 which connect the armature disk 3 with the annular body 8 and this body with the hub part 9^d of the loose lamellae carrier, and on the other hand by means of a cuff 35 connecting said hub part with the adjusting collar 20. Besides, a crooked sheet-metal disk 36 is provided, the outer rim of which is connected up to the inner rim of the armature disk 3 and the inner rim of which extends closely to the shaft 6.

HANS KATTWINKEL.

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H. KATTWINKEL
CLUTCH, ESPECIALLY FOR MOTOR CARS
WITH CONTROL CHANGE MECHANISM
Filed July 11, 1941

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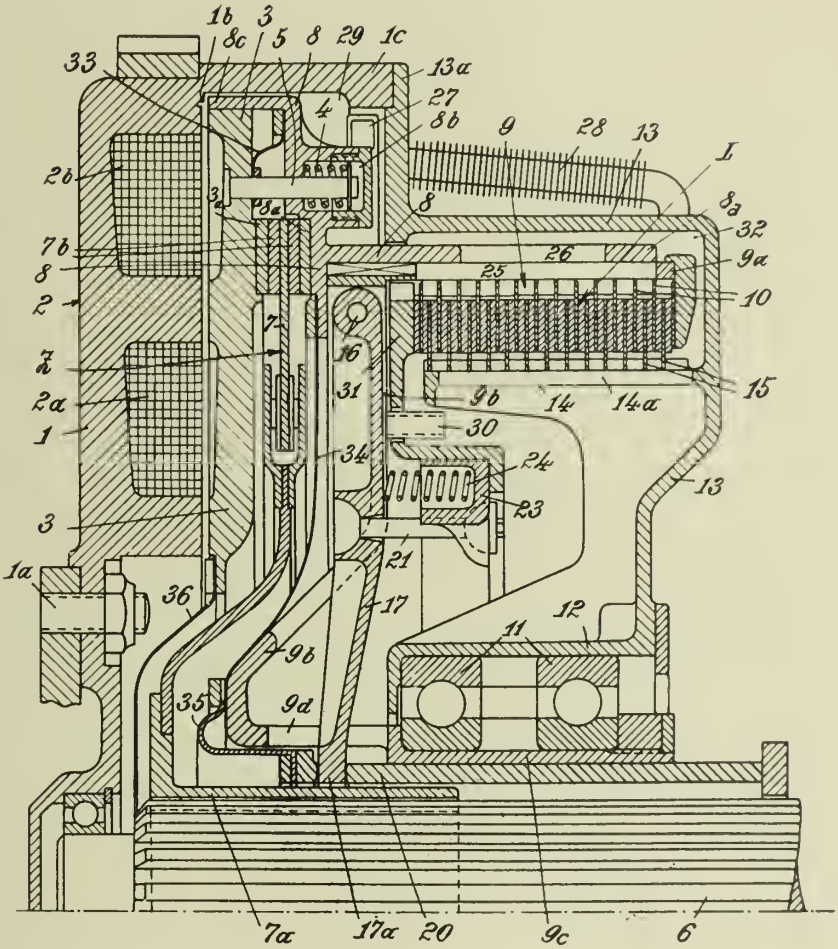
402,024



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ALIEN PROPERTY CUSTODIAN

MEANS FOR MEASURING MAGNETIC FIELDS

Gustav Barth, Berlin, Germany; vested in the Alien Property Custodian

Application filed July 15, 1941

The invention relates to means for determining the magnitudes of a magnetic field, in particular the field strength and the direction of the lines of force of the field, and is a continuation-in-part of my copending application, Serial No. 181,719, filed December 24, 1937, now Patent No. ———.

According to the method and means described in my above-named patent, a body of high magnetic permeability to be exposed to the field to be investigated, is provided with an inductance winding and with current supply means for energizing the winding with a periodically variable current. The field to be measured causes in the body a substantially constant magnetic flux. The electric energization produces another magnetic flux of periodically variable character. The reciprocal or differential effect of these two fluxes is used as a measure of the field magnitudes to be determined. To this end, a measuring or indicating instrument is connected with the circuit of the aforementioned current supply means, or with a separate circuit magnetically associated with the highly permeable body, for instance, by means of a second winding provided on the body. As also described in my above-mentioned patent, the sensitivity of such a measuring system is enhanced by superposing a unidirectional magnetization on the two magnetizations aforementioned. For instance, a rectified current derived from the current to be measured by the instrument is used for producing a superposed magnetization which varies its intensity in accordance with that of the instrument current. This magnetic feedback arrangement amplifies the effect to be determined.

An object of the present invention is to improve on the magnetic field measuring systems of the above-characterized type. Another more particular object of the present invention is to further increase the sensitivity and accuracy of such measuring systems.

To this end, and in accordance with the present invention, a magnetic field measuring system constructed in general as stated above is provided with two magnetizable cores or bodies and with two windings disposed on the magnetizable cores respectively, an energizing circuit being so connected with these windings as to produce in the two cores a periodically variable flux which in one body has a direction opposite to that of the variable flux in the other body. A common measuring or indicating instrument is connected with both windings so as to respond to the differential effect caused by the resultant magnetization of the two bodies respectively.

The present invention will be fully understood from the following description of the embodiments diagrammatically exemplified in the drawing in which

Fig. 1 shows a measuring system containing two separate magnetizable bodies, and

Fig. 2 another measuring system employing a single magnetizable body with two core sections and an amplifying magnetic feedback arrangement, while

Figs. 3 to 5 show further modifications all being different from one another.

The embodiment shown in Fig. 1 is identical with the one disclosed in Fig. 14 and the corresponding description of my above-mentioned patent No. ———, but is not specifically defined in the claims of the patent, the purpose of my present case being to secure also specific protection of the invention represented by Fig. 13 of the patent and to also protect other specific measuring systems of related nature.

The measuring system illustrated in Fig. 1 contains two elongated bodies 10 and 20 of highly permeable magnetic material, for instance Permalloy. The bodies are preferably of great length as compared with their width. They are arranged in spacial parallel relation and become magnetized when exposed to a magnetic field to be investigated, for instance the magnetic earth field, the magnetization being strongest when the bodies lie in the direction of the lines of force. Each body is provided with windings 11 and 21 respectively. The system further contains a direct current source 30, a periodically operating contact interrupter 31, and an indicating instrument 32. The interrupter 31 has two outer contacts 13 and 23 connected with the windings 11 and 21 respectively, and an intermediate contact connected with the current source 30, which in turn is connected through the instrument 32 with the other ends of the windings 11 and 21 respectively. Hence, when in operation, the windings 11 and 21 are energized by a current whose intensity is periodically varied by the interrupter 31. As a result, a periodically varying magnetic flux is superposed in each body 10 and 20 on the unidirectional flux caused by the magnetic field under investigation, the variable fluxes having the same frequency.

The indicating instrument 32 has two windings 12 and 22 of opposite winding direction which are traversed by the currents of the windings 11 and 21 in such a manner that, for instance, in the case of an equal intensity of the currents, their effects on the indicating system of the instrument

are neutralized. For instance, a differential galvanometer, a rotary magnet or the like may be employed as an indicating instrument.

If the arrangement is brought into a magnetic field, for instance of constant field strength, the magnetic constant flux produced by the field in the bodies 10 and 21 affects the reactance of each winding 11 or 21, and the intensity of the current flowing through the winding is changed correspondingly. The superposed magnetization caused in each body by the periodically variable current from source 30, as compared with the constant flux, is additive in one of the bodies and subtractive with respect to the other body, due to the fact that the variable magnetic fluxes caused by the oppositely coiled windings are of opposite direction in the two bodies 10 and 20 respectively. Consequently, the inductive resistances of the two windings 11 and 21 are different from each other, and the currents flowing through the windings 11 and 21 have different intensities. The differential current intensity derived from the currents in both windings is indicated by the instrument 30. As a result, the system is very sensitive as to the strength and direction of the field to be measured.

Such a system may also be provided with the aforementioned means for superposing a third magnetization component on the bodies 10 and 20, for instance a direct current magnetization, in order to select the working range of the magnetization curve of the bodies or for effecting an amplifying magnetic feedback. A modified system providing for an additional magnetization of this type is exemplified by Fig. 2.

According to Fig. 2, a magnetizable and highly permeable body 100 has two narrowed core sections 110 and 120 of elongated shape arranged in parallel to each other. Each section 110 and 120 carries a winding 111 or 121 having one terminal connected with an indicating instrument 132 and the other with a contact 113 or 123 of a vibratory interrupter. The magnetizable body 100 is provided with two additional windings 134 and 135 which are series-connected with each other, an alternating current source 130 and with the instrument 132. The other pole of the current source 130 is connected with the intermediate contact 131 of the vibratory interrupter. The actuating coil 133 of the interrupter is separately connected with the same current source 130 so that the interrupter operates in synchronism with the current source and passes opposite half-cycles of the current alternately through the two windings 111 and 121. As a result, the two core sections 110 and 120 are alternately magnetized in opposite directions. The instrument 132 responds to the currents of both windings and indicates their differential value.

The function of this system is similar to that of the first-described embodiment. However, since the windings 134 and 135 superpose an additional magnetization in accordance with the instrument current, the effect of the field to be determined is amplified and the sensitiveness of the system further enhanced.

The measuring system illustrated in Fig. 3 contains two magnetic bodies 210 and 220 of highly permeable material. These bodies may again consist of two separate magnet cores or they may form sections of one and the same magnetic structure. Each of the two bodies is provided with a winding 211 and 221 respectively. One end of each winding is connected through an electric valve means 212 and 222 respectively, for instance dry rectifiers, with one pole of an alternating current source 230 whose other pole is connected through resistors 213 and 223 respectively with the other ends of the windings 211 and 221. An indicating instrument 232 is connected across both resistors 213 and 223. Due to the action of the valves 212 and 222, opposite half-waves of the alternating current from source 230 are passed through the two windings 211 and 221. The windings are so connected that these alternating half-waves produce in the bodies 210 and 220 magnetizations of opposite directions. Consequently, an additive magnetization caused by one of the windings is superposed in one body to the magnetization caused by the magnetic field to be investigated, while the magnetization caused by the winding in the other body is subtractive with respect to the magnetization effected by the field. The inductive resistance of each winding 211 or 221 is varied in accordance with the resultant magnetization in the appertaining magnet body. The instrument 232 responds to the currents in both windings 211 and 221 and indicates their differential effect. The instrument 232 and the frequency of the alternating current source 230 are preferably adapted to each other so as to produce a steady indication.

In the measuring system according to Fig. 4, two magnetizable bodies or sections 310 and 320 are provided with windings 311 and 321 connected through resistors 312 and 322 respectively with a direct current source 330, and a periodically operating switch, for instance of the vibratory type, is interposed between the windings and the direct current source. The two contacts of the interrupter are designated by 331 and 333. An indicating instrument 332 is connected with the two resistors 312 and 322 so as to respond to the currents in both resistors in a manner similar to the operation of the indicating instrument in the system of Fig. 3. It will be seen from Fig. 4 that during the current-transmitting intervals of the interrupter an energizing direct current flows through the two windings 311 and 321 in opposite directions. Consequently, the superposed magnetizations effected by these windings have opposite directions in the two bodies. The instrument 332 indicates the differential effect of the resultant magnetizations.

As described in the foregoing, it is possible to provide systems according to the present invention with means for superposing in the magnetizable bodies a unidirectional magnetization permitting a selection of a preferable range of the magnetic characteristic. An embodiment of this type is exemplified by the system shown in Fig. 5. According to this figure, the two magnetizable bodies 410 and 420 of high permeability have each a winding 411 or 421 connected with an alternating current source 430 and with the primary winding of a transformer 412 or 422. The secondary windings of the two transformers are connected in series with each other and with an indicating instrument 432. The point intermediate winding 411 and transformer 412, and the midpoint between winding 421 and transformer 422, are connected with each other through an adjustable resistor 441 and a direct current source 440. The network of this system is so designed that the alternating current ine either winding has at any time the opposite direction from the current in the other winding. Consequently, the instrument 432 operates in a manner similar to that described with reference to

the previous examples. The direct current source superposes a constant unidirectional energization in the two windings and consequently, a unidirectional auxiliary magnetization in the two bodies. The intensity of this auxiliary magnetization can be varied by means of resistor **441**. Instead of connecting the direct current source with the alternating current windings **411** and **421**, it is also possible to provide the magnetizable bodies with additional windings carrying the direct current. It will also be apparent from the various examples above described that a great number of different systems according to the invention can be designed, the common essential characteristic being that two magnetizable bodies are provided to be exposed to the magnetic field to be measured, and that in these two bodies a variable magnetization is superposed having opposite directions in the two bodies, the differential effect caused in an electric measuring circuit by the resultant magnetizations of the two bodies respectively, being used as a measure of the determinant of the field to be investigated.

GUSTAV BARTH.

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MAY 18, 1943.
BY A. P. C.

G. BARTH

MEANS FOR MEASURING MAGNETIC FIELDS

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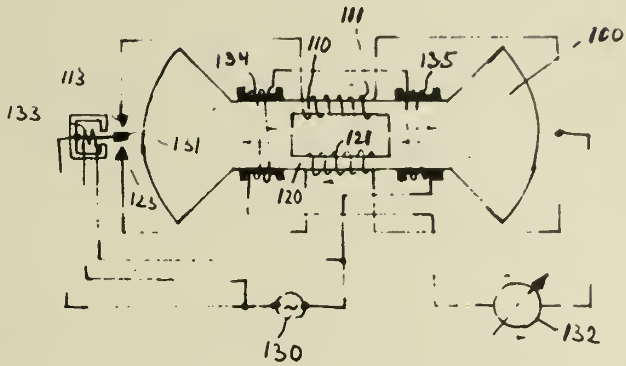


Fig. 2

Fig 1

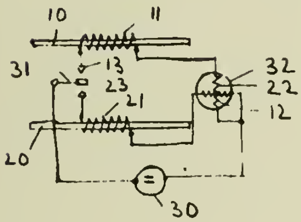
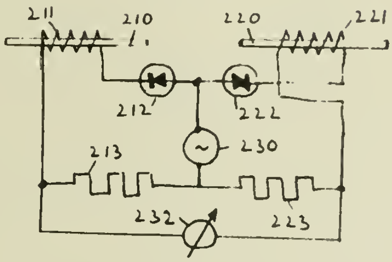


Fig. 3



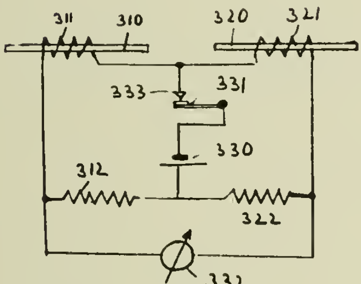


Fig. 4

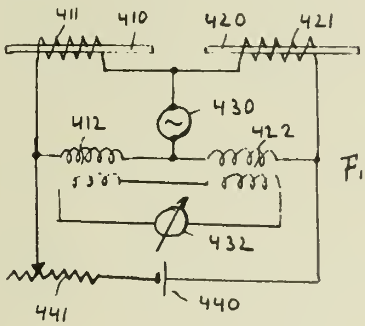


Fig 5

F21081 Su.?

Gustav Barth
Inventor
by Hughes
Attys.

Published May 18, 1943

Serial No. 402,549

ALIEN PROPERTY CUSTODIAN

SOUND ARRESTER IN THE VENTILATOR OF SOUND-ARRESTING ROOM

Masaichi Tominaga, Kamata-ku, Tokyo, Japan; vested in the Alien Property Custodian

Application filed July 15, 1941

This invention relates to a sound-arresting structure consisting in the feature that the inner surface of the cylindrical ventilator in the sound generating room is all covered with a sound-arresting material, having, on the inner surface of the upper portion of the ventilator, a female screw shaped sound-absorbing wall projected inwardly, so as to eliminate sound waves in advancing them spirally.

The object of the present invention is to manufacture economically a sound-absorbing apparatus which completely prevents sounds from flowing outside the room.

There have generally been used at the mouth of ventilator on the roof, in order to eliminate sounds flowing out of the ventilator of the sound generating room, the same sound arresters as those used on the floor of doorways, which mostly required reinforcement works enough to support their weight. In particular, when such sound arresters are shaped unsuitable for their use on heights, a special ventilator suitable to such arresters should be built at an extra cost, which has put users to a great inconvenience.

The present invention is, with object of removing the foregoing defects, provided, on the roof or flank of the sound generating room, with one or more cylindrical ventilators each having, on the inner surface, a spirally projecting sound-absorbing wall whereby the ventilating cylinder is rather reinforced and whereby the absorption of sounds and spiral run of the air current are effected favorably.

The construction of the invention is illustrated in the accompanying drawing, in which

Fig. 1 is an elevation of sound generating room provided with the sound-absorbing apparatus according to the present invention partly showing a sectional elevation along a line C—C of Fig. 2.

Fig. 2 is a sectional plan along a line A—A of Fig. 1.

Fig. 3 is a sectional plan along a line B—B of Fig. 1.

Fig. 4 is a sectional elevation along a line E—E of Fig. 5 in case two paralleled spiral walls are provided.

Fig. 5 is a sectional plan along a line D—D of Fig. 4.

These figures illustrate the present invention by two examples. As regards the sound-arrester at the mouth of ventilator shown in Figs. 1, 2 and 3, there are provided, at the four corners of the sound-arresting room 6 in which such noisy sound generator as machinery, engine, propeller for trial or talkie filming projector is held, with cylindrical ventilators 2 erected on the floor and passing through the roof, each ventilator being cut away, in its inner part facing the room 6, to an air-inducing opening 3. All over the inner surface of the said ventilating cylinder, a sound-absorbing plate 2' is pasted, and, in the upper part of the cylinder i. e. in the part above the ceiling of the room, is provided, on its inner wall, with a female screw shaped sound-absorbing wall 4 projecting inwardly at a height of about a third the diameter of the cylinder. The length of the said screw shaped sound-absorbing wall is limited to a round or, if necessary, to two or three rounds. If the pitch of the screw shaped wall is steep, the ventilation is good, because the number of the wall rounds is small, but chances of repeated sound absorptions reduce. If the pitch is gentle, the absorption of sounds is complete, but as the number of the wall rounds increases the ventilation is obstructed proportionally. The pitch and number of rounds in the said screw shaped sound-absorbing wall are therefore to depend on the strength of the sounds coming from the sound generator.

A sound observation room 5 is built at the middle of the sound-arresting room 6, and, around the room 5, is placed a sound generator the sounds generated therefrom being observed by the observers in the room 5.

As one of the modifications of the present invention, shown in Figs. 4 and 5, a column 7 having on its circumference a male screw shaped sound-absorbing wall 8 with the same pitch as that of the abovementioned female screw shaped wall 4 is set up coaxially in the said female screw shaped sound-absorbing wall 4. In this apparatus, as two spiral sound-absorbing walls lie alternately and doubly in the ventilating cylinder, the effect on arresting sounds is far better than the case when a single wall is used.

As the present invention is in the foregoing construction, sound waves coming from the sound generator in the sound-arresting room 6 are induced to the air-inducing opening 3 directly or after reflection from the wall, floor and ceiling of the sound-arresting room 6, and the sounds of short wave-length are partly absorbed and eliminated by the sound-absorbing wall 2' in the cylinder. The remaining sounds first collide with the lowest slant of the screw shaped wall 4, and thereafter, repeating reflection between the slant walls facing each other, the sounds are repeatedly absorbed and completely eliminated.

The sounds of long wave-length difficult of elimination effect various reflections in various

directions between the said slant screw-shaped walls and create sufficient phasic differences among the sound-waves, in consequence of which the sounds are eliminated completely after their mutual interferences.

In the present invention, the passage for various sounds of long and short wave-length is, as abovementioned, spirally extended in order to effect complete sound-eliminating operations in specially complicating the reflection of the sounds in the said spiral passage, and, in addition thereto, it is free from obstruction to the ventilation, and hence the present invention can be used more effectively than those hitherto used.

In case the mouth of the ventilator is opened in the side-wall of the sound-arresting room, the ventilating cylinder having the foregoing screw shaped sound-absorbing wall on the inner wall may be disposed horizontally. The ventilating cylinder having similar spiral wall may also be constructed on the ceiling instead of on the floor. The use of sound current regulators at the entrance of the ventilating cylinder makes the present invention more effective. The number and diameter of the said ventilating cylinder depend upon the area of the sound-arresting room and kinds of sounders.

MASAICHI TOMINAGA.

PUBLISHED

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M. TOMINAGA

SOUND ARRESTER IN THE VENTILATOR
OF SOUND-ARRESTING ROOM

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FIG. 1

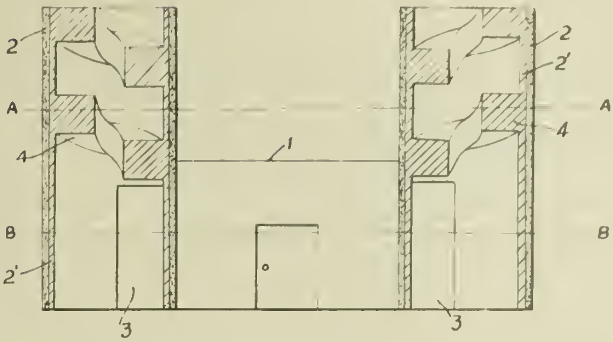


FIG. 2

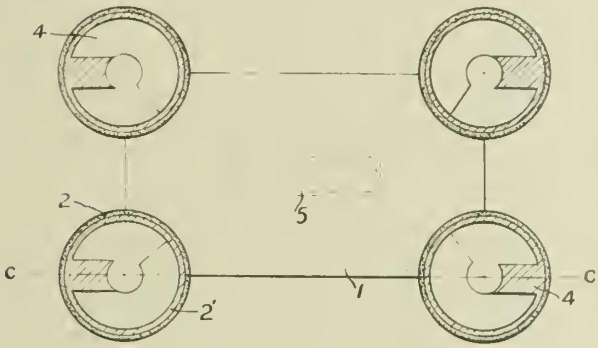


FIG. 4

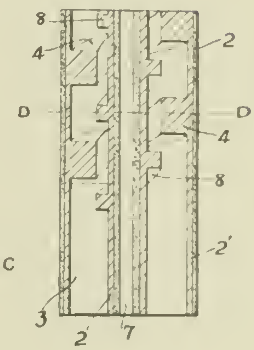


FIG. 3

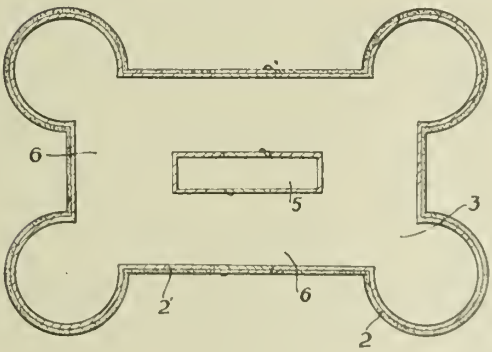
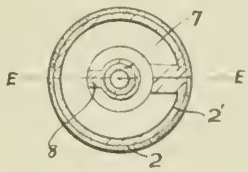


FIG. 5



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INVENTOR

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Attys

Published May 18, 1943 Serial No. 403,046

ALIEN PROPERTY CUSTODIAN

PROCESS OF CONTINUOUSLY PURIFYING AND SEPARATING A MIXTURE OF HIGHER ALCOHOLS BY DISTILLATION

Otto von Keussler, Darmstadt, Germany; vested in the Alien Property Custodian

Application filed July 18, 1941

This invention relates to a Process of continuously purifying and separating a mixture of higher alcohols by distillation.

In further working up the waste gases of petroleum cracking, the so-called "Restgase" of the Fischer-Tropsch procedure, and similar industrial gas mixtures containing propylene and butylene, there are formed aqueous mixtures of alcohols (vide United States Patent 2,080,064, page 1, line 10–24, 48 and following) mainly composed of isopropyl and secondary butyl alcohols. Although the boiling points of these two alcohols are relatively far apart—isopropyl alcohol boils at 82.4°, sec.-butyl alcohol at 99.6°—they cannot be separated from aqueous mixtures by distillation, as both alcohols form azeotropically boiling distillates with water. Thus isopropyl alcohol boils with 12% by weight of water at 80.4°, sec.-butyl alcohol with 32% by weight of water at 88.5° azeotropically. If both alcohols are present in the aqueous mixture, there comes over at its rectification an alcohol mixture which, according to the relative amount of the alcohols, contains between 15 and 25% water and boils at 83–87°.

The said industrial alcohol mixtures contain various amounts of impurities, e. g. still higher sec. alcohols, the ethers corresponding to the alcohols, and compounds not known yet in detail. These impurities partly form, as well with isopropyl alcohol, sec.-butyl alcohol, and water, as also among themselves, azeotropically boiling mixtures that interfere with the rectification of the crude alcohol mixture.

It was found that out of the said industrial mixtures pure isopropyl and sec.-butyl alcohol may be obtained, by proceeding according to the invention as follows (vide Fig. 1).

The crude alcohol mixture used as starting material is first fed continuously to a first column for preliminary purification **2**, at the top of which the low-boiling impurities are drawn off as distillate, washed out in a separator **3**, and separated into two layers. The upper layer (the head) may be separated into its components by rectification, as described in detail below, the low aqueous layer is fed again to the column for preliminary purification **2**.

From the bottom of the fore-column the aqueous alcohol mixture freed from low-boiling impurities continuously runs to a second column for preliminary purification **8**, at the top of which the concentrated alcohol mixture boiling azeotropically with water is drawn off. The main quantity of water runs off as singlings ("Lutterwasser") at the bottom of this column through line **14**. Between bottom and top of the column there are concentrating in an intermediate zone medium-boiling impurities, which are drawn off at **9**.

The distillate of the second fore-column **8** is continuously fed to the main column **16**, where it is dehydrated by azeotropic distillation with addition of one of the well-known "entraining agents," and then separated into its components, isopropyl alcohol and sec.-butyl alcohol. In this main column there are three zones to be distinguished. In the upper zone of the column the dehydration by azeotropic distillation is going on, in the intermediate zone the isopropyl alcohol is concentrating, and in the lower part of the column the sec.-butyl alcohol is freed from isopropyl alcohol.

The isopropyl alcohol concentrated in the intermediate zone is fed to an after-column **22** and drawn off as a purified anhydrous distillate, whereas the sec.-butyl alcohol collecting at the bottom of this column and still containing isopropyl alcohol is carried back to the main column **16**.

At the bottom of the main column **16** the anhydrous sec.-butyl alcohol is collecting. It is rectified in a second after-column **26**, in such a manner that as distillate the anhydrous and rectified alcohol appears, whereas high-boiling impurities, if any, are drawn off at the bottom of this column.

As a matter of course all the arrangements and auxiliary measures known from the rectification technique may be applied in carrying out the above process, e. g. direct and indirect heating of the columns respectively, prewarming of the cold liquids entering the apparatus by the hot ones leaving it, automatic control of the amounts of liquid continuously entering the columns and apparatus and leaving them, carrying back of the alcohols obtained by azeotropic dehydration from the aqueous layers into the apparatus, neutralisation of the crude alcohol mixtures and fractions during operation etc.

The head from the first fore-column **2** may be separated into its components by rectification as follows:

After distilling off of the lowest-boiling components, there appears without addition of an "entraining agent" and azeotropically boiling mixture, which is separated into two layers in a separator. For better separation water is suitably added to the azeotropic distillate before entering the separating funnel. The lower aqueous layer is carried back into the first fore-column **2**. The upper layer is collected as a separate frac-

tion. If there is no more water in the distillate, the further higher-boiling components of the head go over according to their boiling points or to the azeotropic boiling points formed between them, respectively, in an anhydrous state, and may thus be separated into further fractions. In case of larger amounts of head the separation of the head according to the above principles may also be carried out in continuous operation.

The medium-boiling impurities drawn off from the second fore-column **8** at **9** are further treated as follows (vide Fig. 2).

At first they are separated into two layers in a separator **11** after addition of water through line **10**. The lower aqueous layer is carried over again to column **8** through line **13**. The upper layer is first carried over through line **12** to a first auxiliary column **30**, at the top of which an alcohol mixture of isopropyl and butyl alcohol boiling azeotropically with water and at the bottom of which a practically anhydrous mixture of higher-boiling alcohols is drawn off. If the amount of isopropyl and butyl alcohol dissolved in the upper layer is not sufficient for dehydration, either anhydrous isopropyl alcohol from **24**, or anhydrous butyl alcohol from **28**, or benzene from **18** is fed to the top of the auxiliary column **30** through line **31**. The distillate of column **30** is carried back to column **8** through line **32**. The added alcohol or benzene, respectively, thus performs a circular course throughout the apparatus.

The practically anhydrous, higher-boiling alcohols drawn off at the bottom of column **30** through line **33** may be carried over to a second auxiliary column **34** and here be separated into two fractions at **35** as distillate and at **36** as residue. At **37** and **38** intermediate fractions may be taken, if need be.

Example

1,000 litres alcohol mixture per hour, obtained from the "Restgase" of the Fischer-Tropsch procedure, containing 70 vol. of water, are continuously carried through line **1** to column **2**. One part of the distillate goes back to column **2** as reflux, the other part is carried over to the separator **3** after addition of water through line **4** and here separates into two layers. The upper layer (the head) is drawn off at **5**, the aqueous layer returns through line **6** to column **2**. The alcohol mixture free from head passes at the bottom of column **2** through line **7** to column **8**. The impurities concentrating in the central part of column **8** are drawn off at **9** and separated into two layers in the separator **11** after addition of water through line **10**. The washed-out impurities are drawn off at **12**, the aqueous layer returning through line **13** to column **8**. The main quantity of water leaves the apparatus through line **14**.

The alcohol mixture concentrated to a water content of 15–20% is carried over to column **16** through line **15**. In the upper part of the column the alcohol mixture is dehydrated by azeotropic distillation, e. g. with benzene. The ternary distillate is separated into two layers, as usual, in separator **17**. The benzene returns to column **16** through line **18**. The aqueous layer is carried over to column **20** through line **19** for regaining of the alcohol contained in it. The regained alcohol is carried back into the operating circle, e. g. into line **15**.

The isopropyl alcohol concentrating in the central part of column **16** goes through line **21** to column **22**, whereas the sec.-butyl alcohol still contained in it returns to column **16** through line **23**. About 180 litres of purified anhydrous isopropyl alcohol are obtained through line **24** as distillate every hour.

From the bottom of column **16** the sec.-butyl alcohol runs to column **26** through line **25**. At the bottom of this column any high-boiling impurities, if still present, may be removed through line **27**. The purified anhydrous sec.-butyl alcohol in an amount of 100 litres per hour is obtained as distillate through line **28**. To every column there belongs a condenser **29**. The line carrying off the condensate is provided with a ventilation in the usual manner.

OTTO VON KEUSSLER.

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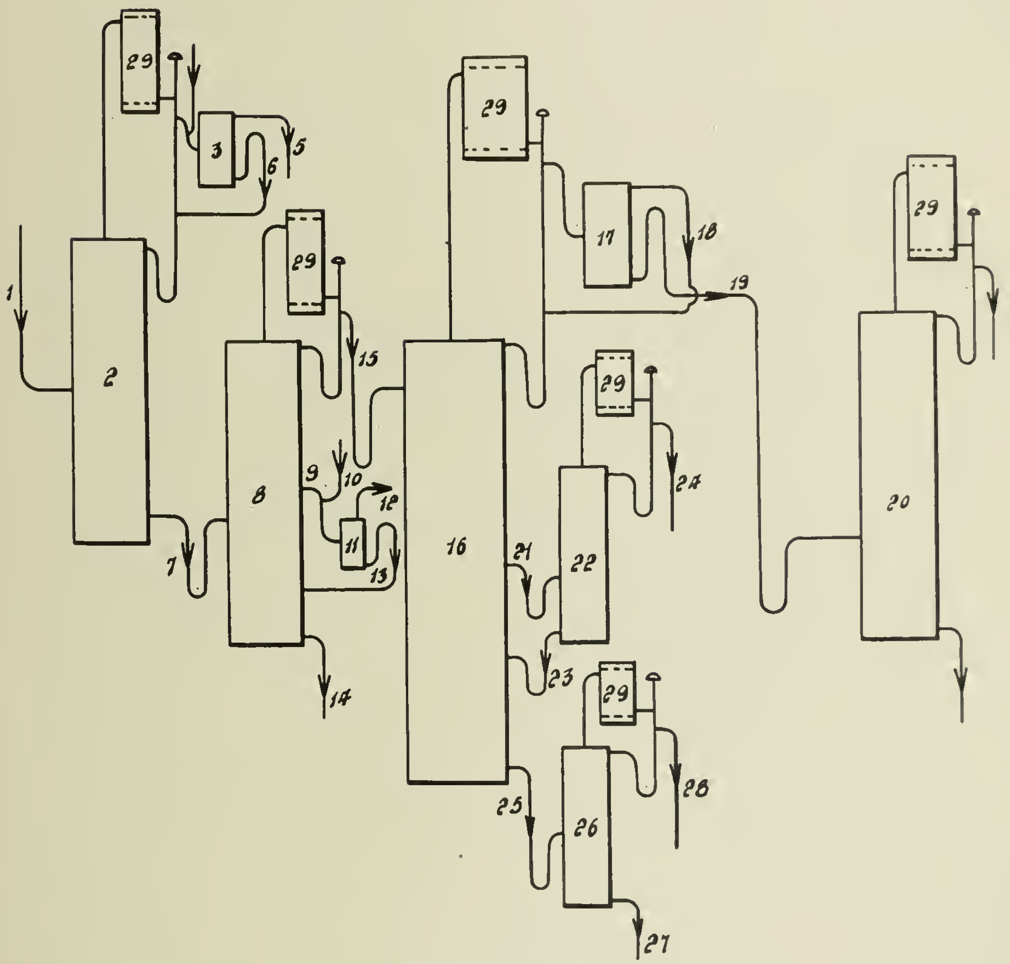
MAY 18, 1943.
BY A. P. C.

O. VON KEUSSLER
PROCESS OF CONTINUOUSLY PURIFYING AND SEPARATING A MIXTURE OF HIGHER ALCOHOLS BY DISTILLATION
Filed July 18, 1941

Serial No.
403,046
2 Sheets-Sheet 1

Fig. 1.



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O. VON KEUSSLER
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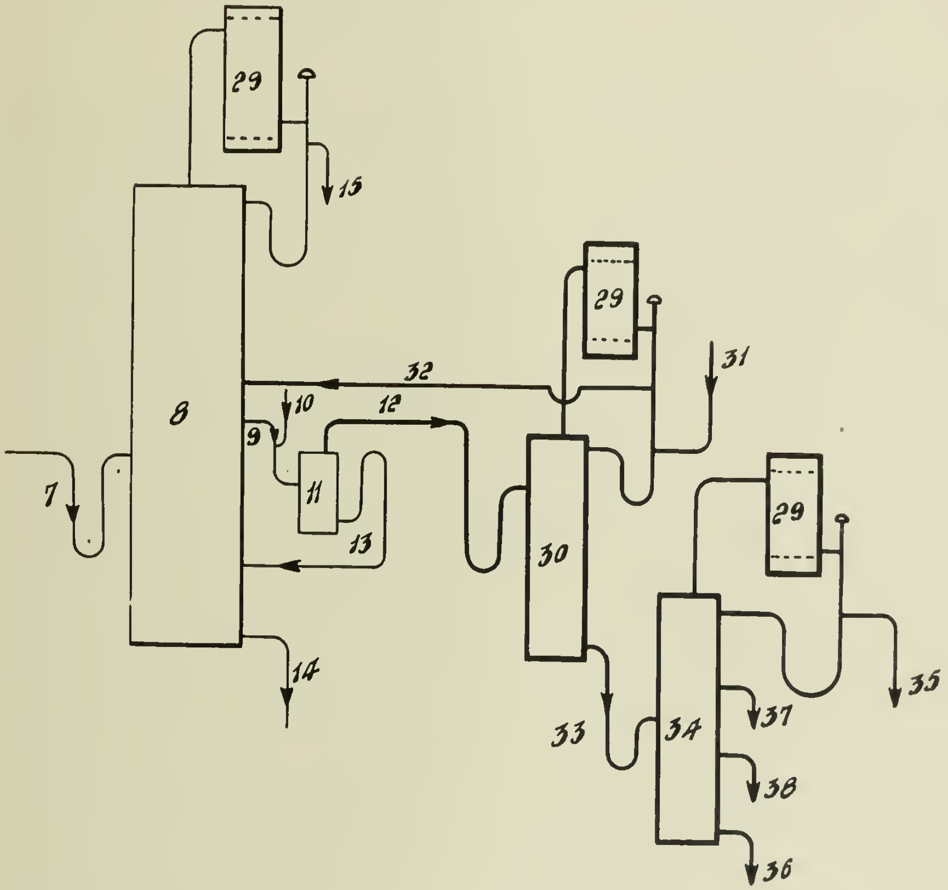
Serial No. 403,046

2 Sheets-Sheet 2

Fig. 2.



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Serial No. 403,096

ALIEN PROPERTY CUSTODIAN

PIEZO-ELECTRIC CRYSTAL MOUNTING

Rudolf Bechmann, Heinz E. Kundt and Heinrich Bremer, Berlin, Germany; vested in the Alien Property Custodian

Application filed July 19, 1941

This invention relates to a new and useful supporting or mounting means for long-wave piezoelectric crystals, and is an addition to patent application Serial No. 368,804, filed Dec. 6, 1940 (RCA Docket 19410).

In the parent application Serial No. 368,804, supporting or mounting means for long-wave quartz crystals have been disclosed of a construction so that the crystals the surface of which is suitably metallized are attached at nodal points on a single mechanical rigid pestle-like member which acts as a support to hold the plate. It has been stated that a particularly convenient supporting method is to solder the plate on the pestle support. Among the plates suited to carry this method into practice have by way of example been mentioned longitudinal oscillators or vibrators, in other words, plates or crystals which are excited to experience longitudinal or transversal cross (contour) or lengthwise vibrations and the natural period of which is practically governed by the diameter or the length of side or edge.

With first approximation, the natural vibrations of such longitudinally vibrating plates or crystals area function only of the dimensions of the crystal plane, while the thickness of the crystal plays no part. As a result of longitudinal and transversal cross (contour) construction and transverse shearing coefficients, vibrations of reduced amplitude arise, in the presence of longitudinal vibrations of the crystal, also in the direction of the thickness of the crystal, and these propagate in the form of progressive waves along the pestle or stem in a case where the latter is secured by soldering.

Fig. 1 illustrates this action. Soldered upon the quartz plate or crystal Q is the pestle or stem S. On the latter, for finite length of stem S, there arises a standing wave having nodes at points indicated by K and loops or anti-nodes at points marked B. If, then, stem S is supported at one place, for instance, which happens to lie in the vicinity of a loop, the supporting or mounting means will also be excited to experience vibrations inasmuch as the crystal holder or mounting system is now in fixed coupling relation with the crystal, and this entails incidental frequency changes and a rise in the damping of the vibrating system, as compared with a freely vibrating crystal. This action, as has been ascertained experimentally, arises not only in the case of longitudinally vibrating crystals where coupling with the holder stem is predicated upon the longitudinal transversal contraction coefficient, but also with transversal vibrations in which case, where crystalline plates are dealt with, these arises also a certain inter-action coefficient, that is, the cross shearing coefficient.

Now, according to the invention, the drawbacks and difficulties hereinbefore described are obviated by supporting or holding the stem at a nodal point of the standing wave arising along the stem. It will be found expedient in this connection to make the range required for holding as narrow as feasible, that is, so narrow that it may be regarded as very small compared with the half-wave length of the wave arising on the stem.

A simple exemplified embodiment of the basic idea underlying this invention is shown in Fig. 2 of the appended drawing where the stem S has a cylindrical extension A which is located at a nodal point of the standing wave developing on the stem. The distance *d* between crystal plate and extension or cross-piece A is therefore roughly $\frac{1}{4}$, $\frac{3}{4} \times$ wave-length (λ).

The reaction of a holder or mounting system on crystal and holder stem S turns out to be particularly small where the cylindrical extension A, as shown in Fig. 3, is laterally clamped in. For instance, the extension A of stem S is clamped or tensionally held between two sheets or laminae B which are pressed together by the screws S*ch*.

An exemplified embodiment of a completely mounted crystal along the line of the above disclosure is shown in Fig. 4. The support T which bears the stem with a cylindrical extension piece is secured upon a base plate G. The electrical connection of the two metallized surfaces of the crystal is established through the said support and the stem, and further, for example, through a supply lead wire Z, while connection with crystal Q is insured by means of a slender wire D which is soldered fast on crystal Q and the connecting wire Z.

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PIEZO-ELECTRIC CRYSTAL MOUNTING

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Fig. 1.

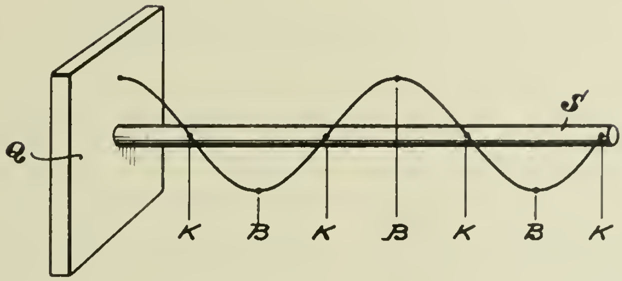


Fig. 2.

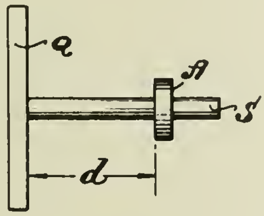


Fig. 3.

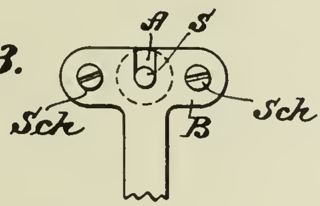
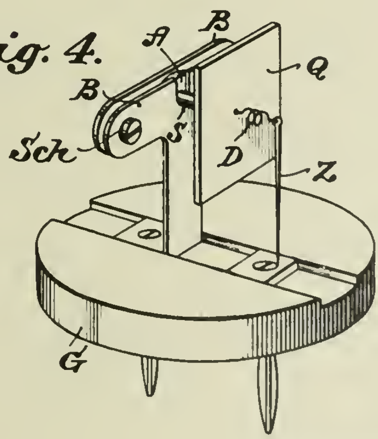


Fig. 4.



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Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

TABULATING MACHINES OR THE LIKE

Bernard Leger, François Dussaillant, Fernand Bessiere and Fernand Boyer, Paris, France; vested in the Alien Property Custodian

Application filed July 23, 1941

This is a divisional of our application for United States Patent Serial No. 236,024 filed October 20, 1938.

In our Patent Application No. 236,024, we have described improvements in tabulating machines in view of allowing the same to print at the same time the receipts and the memoranda in one single impression upon continuous paper bands which are superposed and separated by carbon paper or the like.

The difficulty consisted in causing the superposed bands to advance to variable quantities without them rubbing one against the other.

After having printed every debit, it is in fact necessary to cause the receipt to be fed along the whole of its height, for instance from eight to ten centimeters, whilst the memorandum is to be advanced only to the extent of an interline, i. e. a few millimeters.

In order to overcome said difficulty, the invention consists in utilising receipts which are broader than the memoranda and in arranging a feeding and guiding device for the endless bands so that the memorandum and a band of carbon paper will pass together around the platen by bearing against the latter, whilst the band of receipts will pass around said platen by bearing at its edges against two drums, the diameter of which is somewhat larger and which can revolve independently from said platen, so that it may be freely moved relatively to the memorandum and the band of carbon paper, and without rubbing against the latter. The invention also consists in arranging the feeding and guiding device so that an eventual slowness in the displacement of the band of receipts relatively to the displacement of the memorandum will be automatically and immediately taken up.

The present invention more particularly relates to the combination of mechanisms which automatically and simultaneously determine the advance of the receipt and of the memorandum at different linear speeds and which compensates, if need be, any sliding of the receipt relatively to the driving rollers.

The accompanying drawing shows diagrammatically, by way of example, an embodiment of the object of the invention.

Fig. 1 is a vertical section made through the axis of the platen.

Fig. 2 is a cross vertical section.

Fig. 3 is a diagram showing means for controlling the feeding of a memorandum and of a band of carbon paper, on the one hand, and of a band of receipts, on the other hand.

The platen 1 is so mounted as to rotate loosely upon a shaft 2 between two sleeves or drums 3 which are secured to said shaft and whose diameter is somewhat larger than that of the platen.

The band of paper 4 used as a memorandum as well as the band of carbon paper 5 have a width which is equal to or somewhat smaller than the length of the platen 1, whilst the band of receipts 6 has a larger width and bears by its edges against the drums 3.

It will be seen that said band 6 is thus maintained at a small distance from the band 5 and may be freely displaced relatively to the latter.

The impression produced at a point A for example prints simultaneously the receipt and the memorandum owing to the band of carbon paper. When the printing of the required text and numbers has once been effected, the band 4 is fed forwards to the extent corresponding to an interline and the band 6 is fed forward along the whole of the height of a receipt without any friction taking place at this moment between the bands.

The forward motion of the memorandum may be obtained for instance by means of rollers 7, 8, 9, between which the bands 4 and 5 pass together, the intermediate roller 8 being driven and the rollers 7 and 9 being loose and simply pressed towards the roller 8.

The drive of the roller 8 may be obtained in a known manner by means of a pawl 10 which at every revolution of a cam shaft 11 of the tabulating machine will receive through the medium of a control 10*a* of any type, such a to-and-fro motion that it will cause a ratchet wheel 12 to rotate according to a small angle; said rotation is transmitted through pinions 13, 14, 15 to the shaft of the roller 8, in such a manner that the latter will cause the memorandum 4 to advance to an extent corresponding to an interline.

On the other hand, the band of receipts 6 may be driven along by the drum 3, the shaft 2 being driven to this effect and the adherence of the edges of the band to said drums being obtained either by the surface of said drums itself, which is striated or otherwise prepared, or with the assistance of pressing rollers, and the like.

According to Fig. 3, shaft 2 is actuated from a shaft 16 through the medium of pinions 17, 18, 19, said shaft 16 being periodically in mesh with a sleeve 20 to which is imparted a continuous movement of rotation from a shaft 21 actuated by a motor 21*a*. Said shaft 21 of the tabulating

machine transmits its movement to the sleeve 20 through the medium of an endless chain 22 passing over pinions 23, 24. The periodic coupling of the shaft 16 with the sleeve 20 is obtained by means of a coupling sleeve 25 sliding along said shaft 16, said two sleeves being provided with suitable teeth or prongs; the sleeve 25 is axially moved by means of a forked lever 26 rocking about an axis 27 under the alternate attraction of two electromagnets 28, 29. The latter are energized by a dynamo 30 or other current supply and through the medium of cut out switches 31 and 32 controlled by respective cams 33, 34 secured to the cam shaft 11, and of a brush 35 rubbing against a margin of the band of receipts which is perforated with holes 36 spaced apart to an amount equal to the height of a receipt and which slides over a contact piece 37.

The circuit of the electromagnet 28 causing the sleeve 25 to engage the sleeve 20 comprises a circuit 38 in which the generator 30, the switch 31 and the electromagnet 28 are connected in series.

On the other hand, the switch 32, the electromagnet 29, the contact piece 37 and the brush 35 are connected in series with the generator 30 in another circuit 39.

Fig. 3 shows the members at the end of a period of advance of the band of receipts 6: the switch 32 is closed by the cam 34, a hole 36 of the band allows the brush 35 to touch the piece 37, so that the electromagnet 29 is energized and attracts the lever 26, thereby uncoupling the drive of the rollers 3; at the same time, the switch 31 is opened by the cam 33 and the electromagnet 28 is de-energized. The band 6 then remains motionless. The pawl 10 is at rest, so that the bands 4 and 5 are also motionless. The impression at A is then controlled by the cam shaft 11, as in an ordinary tabulating machine.

Immediately after, the cam 33 closes the switch 31, so that the electromagnet 28 is energized and causes the sleeve 25 to engage the sleeve 20; as soon as it is imparted to the sleeve 20, the rotary movement is transmitted to the shaft 2, consequently to the rollers 3, and lasts until the cam 33 again opens the switch 31. Said duration is adjusted so that, in case no detrimental sliding exists, the band 6 will move forward to an extent equal to the height of the receipt and a new hole 36 will present itself under the brush 35 at the moment when the cam 34 closes the switch 32. If a sliding movement has determined a slight slowness of the band 6, the sleeve 25 remains for a moment engaged with the sleeve 20 although the electromagnet 28 is de-energized and the electromagnet 29 is not yet energized.

The driving along of the band 6 is thus still ensured until the perforation 36 comes under the brush 35 and allows the current to pass into the uncoupling circuit 39.

The feeding forward of the memorandum 4 and of the band 5 is produced by the movement of the pawl 10, during the period in which the cam 33 closes the switch 31 and a new impression is controlled by the cam shaft 11 at the end of the period during which the cam 34 closes the switch 32.

Moreover, without departing from the invention, it would be possible to use any other means for driving along the bands 4 and 5, on the one hand, and, 6, on the other hand. For instance, the latter could be driven along by other rollers parallel to the platen 1; the latter could by way of compensation be utilised for driving the bands 4 and 5, the shaft 2 being then connected to the platen 1 and independent from the drums 3, and so on.

It is also to be understood that the device described can be used for printing continuous bands of paper intended for other uses than receipts and memoranda, for instance for printing record cards and recapitulative lists and that it will also be possible to cause one or several other bands with intermediate carbon papers to pass at the same time as the broad band 6, in order to print at the same time several record cards, for instance for various departments of a commercial or industrial concern.

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FERNAND BESSIERE.
FERNAND BOYER.

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MAY 18, 1943.
BY A. P. C.

B. LEGER ET AL
TABULATING MACHINES OR THE LIKE
Original Filed Oct. 20, 1938

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2 Sheets-Sheet 1

Fig.1.

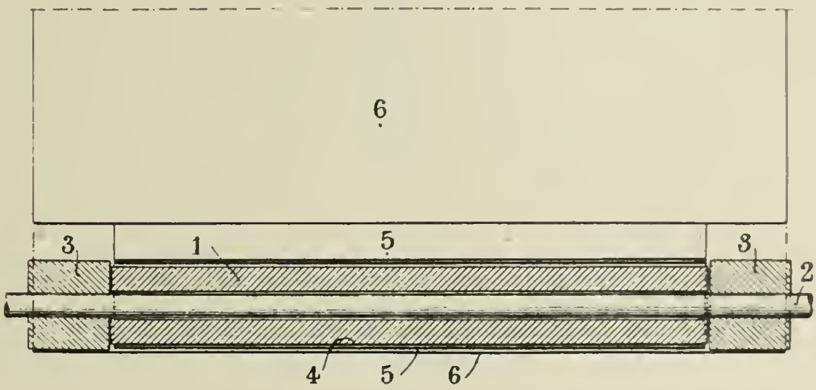
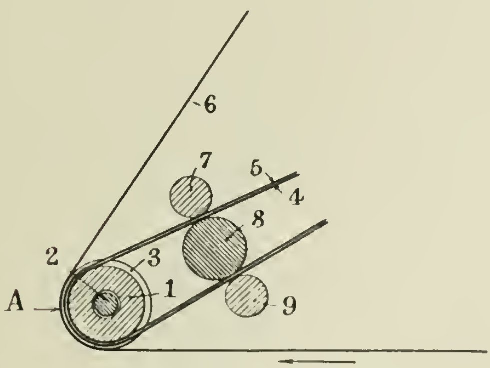


Fig. 2.



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B. LEGER ET AL

TABULATING MACHINES OR THE LIKE

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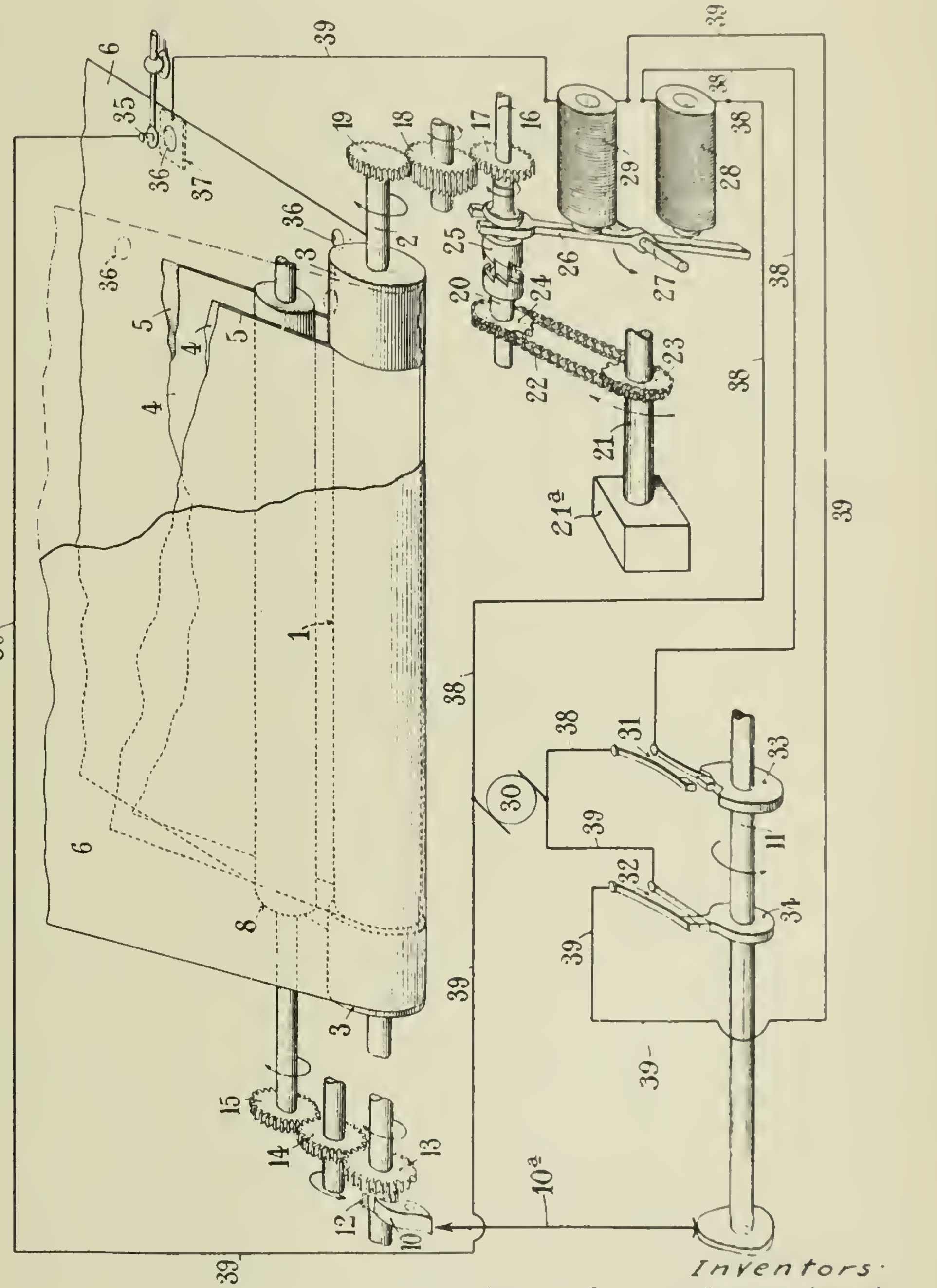
Serial No.
403,628
2 Sheets-Sheet 2

Fig. 3



Inventors:
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Published May 18, 1943

Serial No. 404,631

ALIEN PROPERTY CUSTODIAN

ELECTRIC CONTROLLING SYSTEMS

Albert Patin, Berlin, Germany; vested in the Alien Property Custodian

Application filed July 30, 1941

My invention relates to improvements in electric controlling systems, and more particularly in controlling systems comprising means for producing a magnetic field and an electric coil or similar electric wire system movable in said field and adapted when energized by electric current to move in the said field. The object of the improvements is to provide a controlling system of this type in which the said coil or wire system is adapted to be moved by weak currents, and which therefore has high sensitiveness. With this object in view my invention consists in applying two oppositely directed voltages to the said coil or wire system, one of the said voltages being supplied by a source of electric energy which may be constant during the operation of the system, the other one being supplied by an electric controlling device associated with the apparatus to be controlled.

The said wire system may comprise a single coil which normally is held in equilibrium in the magnetic field, and which is moved in the said field only when the said voltages are unbalanced. In lieu of a single coil two coils may be provided which have oppositely acting voltages applied thereto.

Preferably the said wire system is located in a gap which is free of iron. Thereby the current needed for moving the coil is small and the sensitiveness of the system is high. Further, the movement of the coil is not impaired by inertia.

My improved controlling system may be used for controlling various apparatus, for example apparatus for regulating the voltage of a storage battery by means of a cell switch, or apparatus for regulating the number of revolutions of an engine driven by compressed air, steam or a flowing liquid, and the controlling system may be constructed so that the said apparatus are continuously or momentarily regulated. In the following I shall describe the invention in connection with various apparatus which are particularly instructive for explaining the system and its operation.

In the annexed drawings

Fig. 1 is a diagrammatical elevation showing a system for controlling an electric motor,

Fig. 2 is a similar diagrammatical view showing a system controlling the voltage of a generator under varying conditions of load, and

Fig. 3 is a similar diagrammatical view showing the system as used for controlling the current supplied to a direct current motor, so as to prevent overcharge, for example, when the motor is started.

In the example shown in Fig. 1, the controlling system comprises a permanent magnet or a constant electromagnet indicated in the figure by the signs N—S. In the field of the said magnet an electric wire system is movable, which, as shown, consists of a single coil 2 carried by a rotatable spindle 3 mounted in bearings 4 and 5. To the terminals of the said coil voltages are applied so as to act in opposition to each other, and normally the said voltages are alike. One of the terminals of the said coil is connected to an insulated ring 6 secured to the spindle 3 and having a contact spring 7 in sliding engagement therewith the said contact spring being connected by a lead 8 with a voltage divider 9 connected with a source of electric energy such as a battery 10. The slide contact 11 of the said voltage divider is connected by a lead 12 with a tachometer-dynamo 13 the voltage of which is exactly proportional to the number of revolutions, and the said dynamo is connected by a lead 14 with a contact arm 15 sliding on an insulated ring 16 fixed to the spindle 3 and connected with the second terminal of the coil 2. The field winding 17 of the dynamo 13 is energized by means of a battery 18.

By means of the voltage divider 9 and the dynamo 13 oppositely directed voltages are applied to the coil 2, and normally, that is while the system is balanced, the said voltages are alike so that no current flows through the coil. If, however, the velocity of the dynamo departs from the normal, the coil 2 is energized and it turns about the axis of the spindle 3. The coil is movable in a gap which is free of iron, and therefore, it is moved by very small currents, and its movement is not retarded by inertia.

In the construction shown in the figure the system is intended to control an electric motor 20 having a field winding 21, the object being to maintain the number of revolutions of the electric motor constant. The armature of the electric motor 20 is positively coupled with the armature of the dynamo 13 as is indicated by the common shaft 22. The field winding 21 of the electric motor is connected by leads 23 and 24 respectively with a source of electric energy such as a battery 25 and with a slide contact 26 engaging an insulated ring 27 fixed to the spindle 3. The said ring 27 is connected by a lead 28 with a contact arm 29 engaging a relatively fixed potentiometer 30, the winding of which is connected to the terminals of the battery 25. Thus

the current supplied to the field winding 21 depends on the position of the contact arm 29 on the winding of the potentiometer 30.

The operation of the system is as follows:

The slide contact 11 of the voltage divider 9 is placed on the resistance of the said divider into a position such that the voltage applied from the battery 10 of the divider to the ring 6 connected with the coil 2 is equal to the voltage developed by the dynamo running at the desired speed. Thus, while the electric motor runs at the said desired speed no current flows through the coil 2. If, however, for some reason or other the electric motor changes its velocity, the voltage developed by the dynamo 13 is varied and therefore the coil 2 is energized. Thus, the said coil turns with its spindle 3, and thereby the slide contact 29 is shifted on the potentiometer 30 in one or the other direction and, accordingly, the current supplied by the battery 25 to the field winding 21 is varied. Thereby the speed of the electric motor is varied, until it has attained its normal value, whereupon the coil 2 is deenergized. The coil 2 and slide contact 29 remain in the new position until another regulation is needed.

In Fig. 2 I have illustrated the improved controlling system in connection with a three-phase current dynamo for regulating the voltage of the current generated by the said dynamo in case of varying load.

The phases of the said dynamo and the field winding have been indicated respectively by the numerals 35 and 36. The field winding is energized by a direct current dynamo 37 the field winding 38 of which is energized by a suitable source of electric energy such as a battery 39. The circuit 40 of the field winding includes a resistance 41 adapted to be regulated by hand, and a second regulatable resistance 42. By means of the resistances 41 and 42 the current supplied to the field winding 38 and therefore the voltage of the dynamo 37 and the current supplied to the field winding 36 of the three-phase current dynamo are regulated in accordance with the load of the said dynamo.

The controlling system comprises means for producing a constant magnetic field indicated by the signs N—S, and a coil 43 carried by a spindle 44 and rotatable in the said magnetic field. The said spindle 44 is connected with a slide contact 45 engaging the resistance 42. In the figure the spindle 44 has been indicated diagrammatically, and it will be understood that it is disposed so as to permit the coil 43 to rotate in the magnetic field. The coil is energized by two sources, one a circuit divider 46 having a slide contact 47 and included in a circuit comprising a source of electric energy represented by a battery 48, and the other one a transformer 49 the primary of which is connected across two phases of the dynamo 35, 36. The secondary of the said transformer 49 is connected with a rectifier 50 included in circuit with the coil 43 and the circuit divider 46, 47, 48, and the voltages of the said rectifier and voltage divider act on the coil in opposition to each other.

The operation of the system is as follows:

The voltage divider 46, 47, 48 is set so that the voltage applied thereby to the coil 43 is equal to that of the rectifier 50, and no current flows through the coil. If the load of the dynamo 35, 36 is varied, the voltage across the phases and the voltage of the rectifier are reduced or increased. Thus the rectifier 50 and the circuit divider 46, 47 are unbalanced, and current flows through the coil 43. The said coil is rotated and such rotary movement is transmitted to the switch arm 45, which therefore varies the resistance 42 and the current energizing the field coil 38. Thereby the energization of the field coil 36 of the three-phase current dynamo is changed, until the voltage of the current generated by the phases 35 is again normal.

While in the system shown in Fig. 2 the voltage of the dynamo 35, 36 is regulated by varying the energization of the field winding 36, I wish it to be understood that my invention is not limited to the regulation shown in the figure. For example, the voltage may be regulated by varying the number of revolutions of the engine driving the dynamo, in which case suitable regulating devices are interposed between the coil 43 and the parts connected therewith, and the said engine.

In Fig. 3 I have shown my improved controlling system in connection with a direct current electric motor for preventing an excessive increase of the armature current, for example when the motor is started or overloaded.

The direct current dynamo comprises an armature 55 and a field winding 56 which is energized by a battery 57. To the armature 55 current is supplied from a source of alternating current indicated by the reference numeral 58 through a gas filled rectifier 59 having a grid 60. The anode circuit of the said rectifier includes a resistance 61. The voltage of the current supplied from the rectifier 59 to the armature 55 is regulated by varying the voltage applied to the grid 60. Preferably the phase of the said voltage is displaced with relation to the phase of the anode at an angle of 90°. The voltage is applied to the grid 60 from a source of alternating current 62 through a transformer 63. For regulating the anode voltage of the rectifier 59 a direct voltage is applied to the grid in addition to the voltage applied thereto from the transformer 63, and for this purpose a potentiometer 64 connected with a battery 74 and adapted to be set by hand is connected with the grid 60, and in addition a potentiometer 65 is connected to the grid the contact arm 66 of which slides on a resistance 67 and a rail 68. Normally the arm 66 is in engagement with the rail 68, and it is shifted into engagement with the resistance 67 only when the current supplied to the electric motor 55 exceeds the desired maximum. The potentiometer 64 is adapted to be regulated by hand, while the potentiometer 65 is regulated by means of my improved controlling system.

The said controlling system comprises a constant magnet indicated by the letters N—S and a coil 69. The said coil is carried by a spindle indicated diagrammatically at 70 and carrying the slide contact arm 66. Thus, when the coil 69 is rotated in the field N—S the contact arm is shifted from the rail 68 to the resistance 67 or vice-versa. The coil 69 is included in a circuit 71 including a voltage divider 72 and the resistance 61, the voltage divider 72 applying one of the voltages to the coil 69, and the potential difference at the terminals of the resistance 61 providing the other voltage acting in opposition to the voltage of the voltage divider 72.

The operation of the system is as follows:

The contact arm 66 is set on the rail 68, and the contact arm of the voltage divider 64 is set so that the highest permissible current may flow through the armature 55 without the coil 69

being energized and turned in a direction for shifting the contact arm **66** on the resistance **67**. By the said current a potential difference is produced at the terminals of the resistance **61**, which counteracts the voltage taken from the voltage divider **72** so that the current flowing through the coil **69** is either zero or tends to turn the contact arm **66** anticlockwise and away from the resistance **67**. If now the current flowing through the armature is increased beyond the permissible maximum the potential difference at the terminals of the resistance **61** is increased, and the coil **69** is energized so as to turn the contact arm **66** clockwise. Thereby the direct voltage applied from the battery **73** to the grid **60** is altered in such a way that the time of ignition of the rectifier **50** is displaced and the current flowing through the rectifier is held below the desired maximum.

While in describing the invention reference has been made to various systems embodying the same I wish it to be understood that my invention is not limited to the examples shown in the drawings, and that my controlling system may be used in connection with other apparatus where regulation of any values is needed.

An important feature of the new controlling system consists in that the system may be set so that the regulation or other controlling operation takes place under definite conditions. The controlling system may be used either for directly or indirectly acting on a regulating member, either by means of electrical or mechanical means. It will be understood that the general arrangement and the details of the construction of the controlling system may be adapted to the requirements of the system to be controlled thereby.

ALBERT PATIN.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

A. PATIN
ELECTRIC CONTROLLING SYSTEMS
Filed July 30, 1941

Serial No.
404,631
2 Sheets-Sheet 1

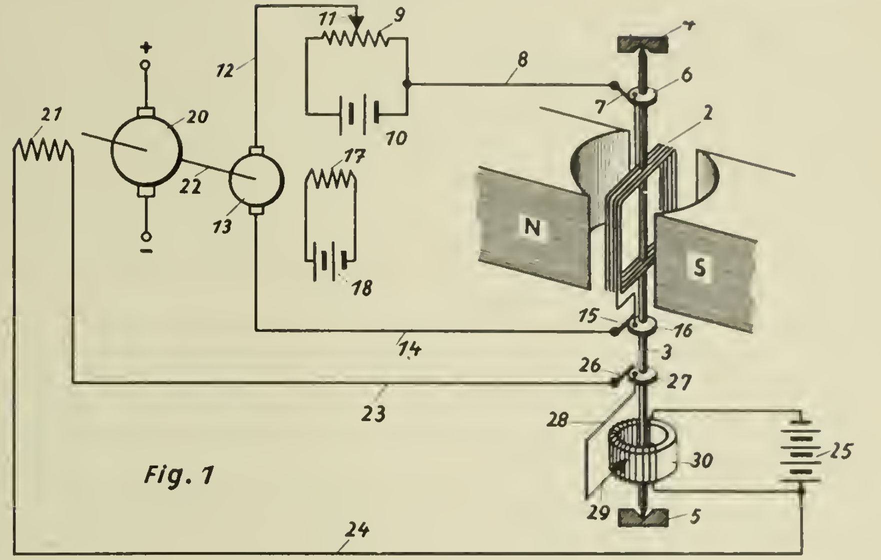

Fig. 1

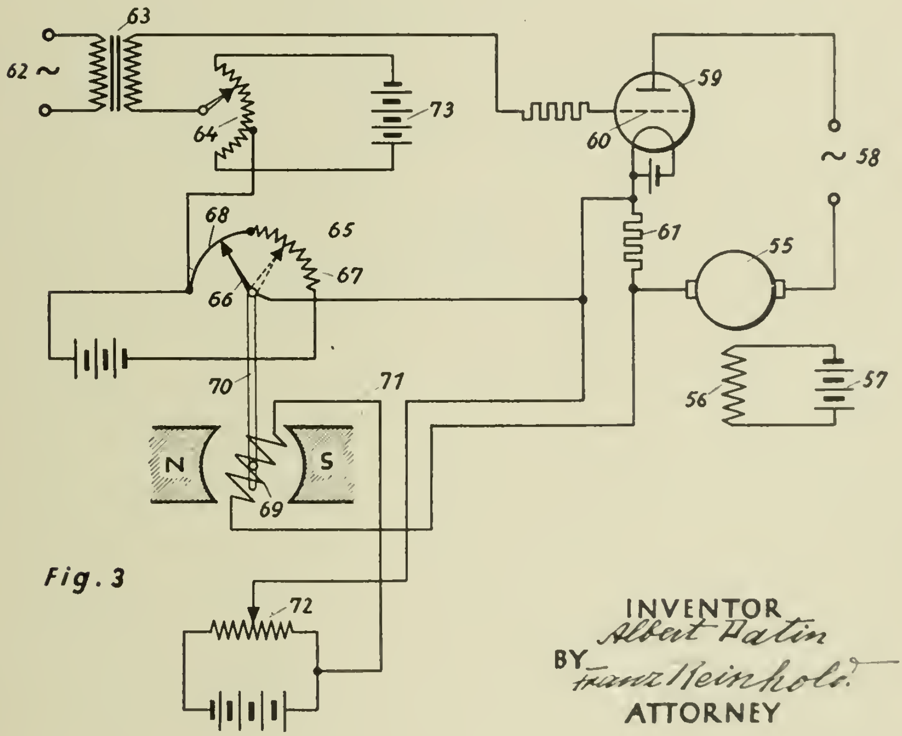

Fig. 3

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MAY 18, 1943.

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A. PATIN

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2 Sheets-Sheet 2

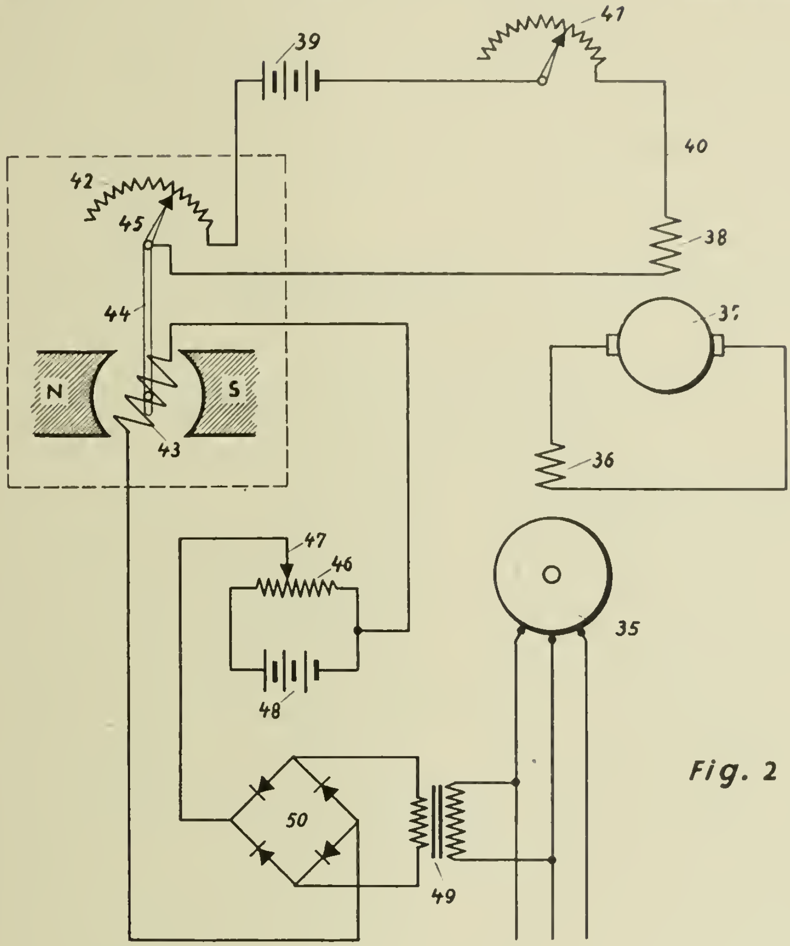

Fig. 2

INVENTOR

Albert Patin

BY Franz Heinhold

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Published May 18, 1943

Serial No. 404,984

ALIEN PROPERTY CUSTODIAN

ELECTRIC CONDENSER

Wilhelm Schneider, Berlin, Germany; vested in the Alien Property Custodian

Application filed August 1, 1941

This invention relates to a novel ceramic condenser plate with metal bushes soldered bilaterally upon the metallic coats, the bushes being connectable at will with the current supply leads.

Ceramic is used in condensers of many kinds. Condenser plates of widely varying forms are in the market which are used especially for the high potentials and loads used in large (power) transmitters. These discs or plates for voltage reasons have collar-shaped or curved edges, while the coats thereof consist of silver applied by hot dip and copper sprayed thereon.

For uniting several condensers, they are furnished with copper foil soldered thereon. The position of these is fixed by a foot or base glazed fast for mounting.

Since the chances of establishing connection are thus strictly defined and fixed, certain difficulties arise to make the device adapted to different circuit organizations and wirings. To make the design more elastic in use, connections and terminals subsequently attached are advantageous.

The present innovation satisfies requirements in this regard so that the assembly of plates is not restricted in so far as the position of the terminals is concerned, and there is leeway also as regards the mode of connection.

An exemplified embodiment of the invention is shown in the appended drawing. Fig. 1 is a section taken through the new condenser body, while Fig. 2 is the junction and assembly of a plurality of such bodies.

The ceramic plate 1 is fitted bilaterally with a centrally disposed terminal or connector piece 2 made of thin sheet metallic material. The tapered journal or pin end of the same has a rolled thread. With a nut 3 to fit and lugs 4 which may be made of different kind to suit requirements it is possible to establish all kinds of connections contradistinct to what is true of the conventional, fixed tieing where it is possible only by complicated soldering or the like.

The use of solderable material is not necessary. Another advantage is that because of the appreciably larger bearing surface of the connector piece 2 upon the coats, much better distribution of current is attained, conditions in this respect being still further improvable by increasing the bearing or supporting diameter.

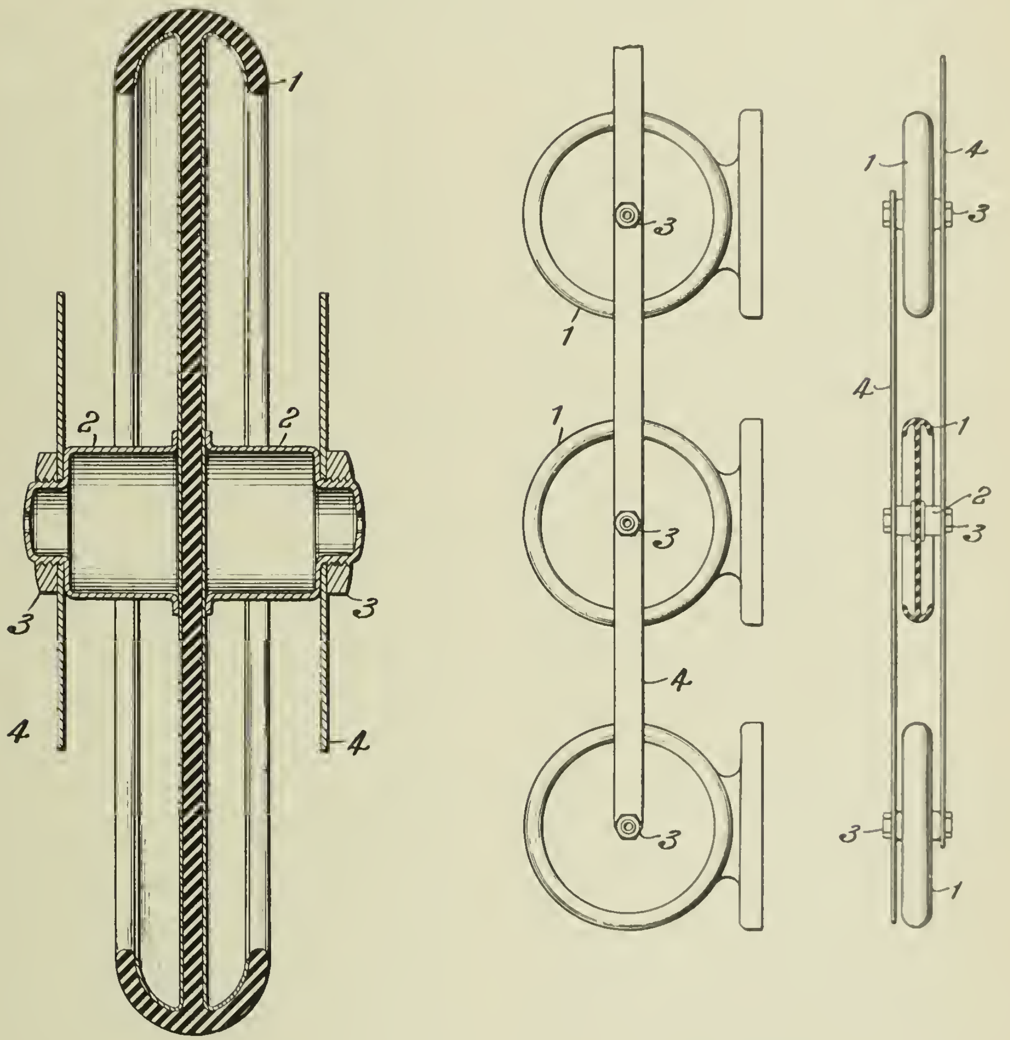
WILHELM SCHNEIDER.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

W. SCHNEIDER
ELECTRIC CONDENSER
Filed Aug. 1, 1941

Serial No.
404,984

Fig.1. Fig.2a. Fig.2b.



INVENTOR
Wilhelm Schneider
BY H. G. Grover
ATTORNEY

Published May 18, 1943

Serial No. 405,985

ALIEN PROPERTY CUSTODIAN

TELEGRAPH TRANSMITTER

Otto Steiner, Berlin-Spandau, Germany; vested in the Alien Property Custodian

Application filed August 8, 1941

This invention relates to printing telegraph apparatus and particularly to keyboard controlled signal transmitting mechanism.

More specifically, the invention pertains to the transmission of facsimile telegraph signals.

An object of the invention is to provide a keyboard controlled facsimile telegraph signal transmitter in which the finger keys may be operated in overlap relation, any finger key being depressible before the transmission of the signal initiated by the previously depressed finger key has been completed.

Another object of the invention is to provide a keyboard controlled facsimile telegraph signal transmitter in which each finger key directly controls a selectable signal transmitting element individual thereto.

In the operation of keyboard devices, it is desirable to afford the operator as much freedom with regard to the timing of successive finger key operations as possible. This enables operators whose normal speed of operation may vary widely or whose timing may be irregular to operate the keyboard devices without special training or practice. When a keyboard transmitter device is so arranged and timed that a key lever may not be depressed until the transmission of the signal represented by a previously depressed key lever has been completed or substantially completed an operator may be obliged to adopt a regular or rhythmic touch considerably at variance with that operator's normal key lever operating technique and such compulsion may be a source of annoyance to the operator and possibly a source of errors in keyboard manipulation. This is particularly true if the system is designed to operate at a relatively low signaling frequency. The obligation to employ a rhythmic keyboard technique may be minimized by so arranging the keyboard transmitter that as soon as the transmission of a signal combination has been initiated so that it may proceed to conclusion without further control from the keyboard mechanism, a second key lever may be depressed and the selective condition controlled thereby stored so that at the conclusion of transmission of the previously initiated signal combination, the transmission of the signal combination represented by the stored selective condition will follow immediately. Thus the keyboard mechanism is free to be operated during a large percentage of each interval allotted to the transmission of the signal combination and the keyboard transmitter approaches, in freedom of operation, the well known typewriter.

According to the present invention each key lever is arranged to rock into operated position a signal transmission controlling lever individual to the key lever. The signal transmission controlling lever becomes latched in operated position and the keyboard mechanism becomes locked so that another key lever may not be immediately depressed. The signal transmission controlling lever withdraws one of two detents from blocking relation to a transmitting contact lever which, however, remains held by a second detent. Each of the transmitting contact levers is normally held by the two detents in position to hold an associated transmitting contact out of engagement with a transmitting drum. The drum is provided with circumferential rows of conductive and nonconductive areas in alignment with each of the transmitting contacts. Upon engagement of one of the transmitting contacts with its associated circumferential row of conductive and nonconductive areas and rotation of the drum a succession of signaling impulses will be generated in accordance with the arrangement of conductive and nonconductive areas and the impulses will be impressed upon a communication channel to which the transmitter is connected.

The transmitting drum may be rotated in start-stop manner or continuously and the shaft by which it is rotated is provided with a cam the first function of which is to release the second of the two detents holding the transmitting contact lever in normal position. Upon release of the second detent, the transmitting contact lever permits the transmitting contact to engage the circumferential alignment of conductive and nonconductive areas with which it is aligned at the proper point on the surface of the drum regardless of whether the drum has just been set in rotation or has been rotating continuously to effect the transmission of the combination of impulses from beginning to end thereof. Immediately following the release of the transmitting contact lever by retraction of the second detent, the cam performs its second function which is to unlock the keyboard mechanism. The unlocking of the keyboard mechanism places it in condition for the depression of another key lever and a key lever may be depressed while the transmission of impulses of the preceding code combination is in progress. If such key lever is depressed its associated signal transmission controlling lever will be rocked to operated position and latched there and the keyboard mechanism will become locked and remain locked until the

timing cam again performs its two functions, namely, the unlocking of the transmitting contact lever to be selected which, it may be added, is accompanied by restoration of the previously selected transmitting contact lever, and unlocking the keyboard mechanism to permit the operation of another key lever.

For a complete understanding of the invention, reference may be had to the following detailed description to be interpreted in the light of the accompanying drawing, wherein

Fig. 1 is an elevational view partly in section showing the keyboard facsimile transmitter according to the present invention;

Fig. 2 is an elevational view partly in section showing details of the keyboard locking mechanism;

Fig. 3 is an elevational view partly in section showing the relation of certain elements when a key lever is depressed; and

Fig. 4 is a fragmentary perspective view supplementing the showing of the locking mechanism in Fig. 2.

Referring now to Fig. 1 the reference numeral 11 designates the supporting frame of the keyboard transmitter according to the invention. A cylindrical rod 12 extending across frame 11 from one side of the keyboard transmitter to the other, and appearing at the right of Fig. 1, pivotally supports a plurality of key levers 13. Leaf springs 15 secured to the frame 2 of keyboard transmitter 11 engage the lower edges of the key levers 13 and urge the key levers to their uppermost positions. Each of the key levers 13 is provided at its foremost end with a finger key 14.

Intermediate the front and rear of the transmitter and extending from side to side above the key levers 13 is a cylindrical rod 16 which receives the bifurcated upper ends of vertically disposed slides or push bars 17. There are as many slides or push bars 17 as there are key levers 13 and each slide 17 extends downwardly past its associated key lever 13 in close proximity thereto. Each slide 17 is provided with a forwardly extending lug or projection 18 and a laterally extending projection 19 of the key lever overlies the lug 18. A tension spring 21 is distended obliquely between each slide 17 and a frame member 20 and urges the slides upwardly and in clockwise direction as viewed in Fig. 1 so that their bifurcated portions rest against the bar 16 and their lower ends rest against a stationary bar 22 secured to the frame 11 of the transmitter.

In addition to the key lever 13 the cylindrical rod 12 also pivotally supports signal transmission controlling levers 23 of which there is one beside each key lever 13. At the foremost end (left-hand end as viewed in Fig. 1) each of the signal transmission controlling levers 23 is provided with a projection or lug 24 which underlies a rearwardly extending lug or projection 26 of the associated slide 17. The signal transmission controlling levers 23 are urged in clockwise direction to bring their projections 24 into abutting relation with the projections 26 of slides 17 by leaf springs 27 secured to the frame 11 of the transmitter in the same manner as springs 15.

The slides 17 are provided with notches, one on the front edge (left-hand edge as viewed in Fig. 1) designated 28, and two on the rear edge designated 29 and 31. All of the slides 17 are identical so that when they are in their normal positions resting against the cylindrical bar 16 all of the notches 28 are aligned transversely of the transmitter, all of the notches 29 are aligned and all of the notches 31 are aligned.

The alignment of notches 28 is adapted to receive a lock bail 32 extending across the entire bank of slides 17 and supported at its opposite ends by arms 33 pivoted at 34. Similarly, the alignment of notches 31 is adapted to receive a lock bail 36 which extends across the bank of slides 17 and is supported at its opposite ends by arms 37 pivoted at 38. Lock bail 36 is provided with a blade 39 extending obliquely upwardly toward the rear of the transmitter from the rearmost edge of the lock bail 36 and the blade 39 normally abuts the rearmost edge (right-hand edge as viewed in Figs. 1 and 3) of a universal bail 41 which is in the form of a pivoted vane extending across the bank of slides 17 and having its foremost edge, which is the left-hand edge as viewed in Figs. 1 and 3, disposed in the alignment of notches 29. Universal bail 41 is shown in Fig. 1 in its normal position and in Fig. 3 in its operated position and when it is in the normal position it holds the lock bail 36 clear of the rear edges of the slides or push bars 17.

At least one of the arms 33 which supports the lock bail 32 is provided with a laterally extending pin 42 (Figs. 2 and 4) and the adjacent one of the arms 37 which supports lock bail 36 is provided with a laterally extending pin 43. A tension spring 44 interconnects the pins 42 and 43 so that lock bail 32 is urged to the right as viewed in Figs. 1 and 2 seeking to enter the alignment of notches 28 and the lock bail 36 is urged to the left seeking to enter the alignment of notches 31.

The pins 42 and 43 carried by the lock bail supporting arms 33 and 37 respectively, are disposed in elongated slots 46 and 47 respectively in a link 48. Link 48 extends to the rear of the transmitter (to the right as viewed in Figs. 1 and 2) and is operable by a cam operated lever, as will presently appear, which normally holds link 48 in its foremost position (left-hand position as viewed in Figs. 1 and 2). Spring 44 urges pin 42 to the right-hand end of slot 46 and pin 43 to the left-hand end of slot 47. Pin 42 does in fact engage the right-hand end of slot 46 when link 48 is in its normal position and in this position the link 48 holds lock bail supporting arm 33 in position to hold lock bail 32 clear of the alignment of notches 28. Pin 43 does not normally engage the left-hand end of slot 47 but is held toward the right of slot 47 by universal bail 41 which holds lock bail 36 clear of the alignment of notches 31.

Upon the depression of any one of the key levers 13 its laterally extending projection 19 engages the underlying projection 18 of the associated slide 17 and depresses the slide, which movement causes spring 21 to become distended. As will be observed by reference to Figs. 1, 2 and 3 the lower left-hand edges of the slides 17 slope rightwardly so that as the slide 17 is depressed it is also rocked counterclockwise by engagement of the sloping portion of its left-hand edge with the stationary bar 22, and the counterclockwise rocking movement is sufficient to cause projection 18 to move out from underlying relation with the laterally extending projection 38 of the key lever. Upon the escape of projection 18 from projection 19 the slide 17 is at once restored by spring 21 to normal position.

Since the foremost edge of universal bar 41 is disposed in the alignment of notches 29, the depression of one of the slides 17 will cause universal bar 41 to be rocked counterclockwise thus withdrawing the rearmost edge of the universal bar from blocking relation to upwardly extending blade 39 associated with lock bail 36. Thus, lock bail 36 is no longer held free of the slides 17 and it

seeks to enter the alignment of notches 31, the slot 47 accommodating movement of the pin 43 by spring 44. Since at this time one of the slides 17 is out of normal position, it will block out lock bail 36 from entering the notches 31 and will continue to block it out until the operated slide 17 has been restored to normal position by spring 21. When the slide 17 has returned to normal position, lock bail 36 is no longer blocked out of the notches 31 and under the influence of spring 44 and the freedom afforded by slot 47 it enters the alignment of notches, thus locking against depression all of the slides 17 which thereby individually block operation of the key levers 13.

It will be apparent that when slide 17 is depressed to its lowermost position by its associated key lever 13, the signal transmission controlling lever 23 associated with the depressed slide 17 will be rocked into extreme counterclockwise position. Lock bail 36 is provided with a depending flange 51 which is bent forwardly obliquely at its lower edge. Each signal transmission controlling lever 23 is provided with an upwardly extending arm 52 the upper end of which extends rearwardly obliquely toward the flange 51 of lock bail 36. The relationship of arm 52 to flange 51 is such that the obliquely extending portion of arm 52 will just clear the lower edge of flange 51 as lever 23 is depressed. The apparatus may even be arranged so that when lever 23 is rocked to extreme counterclockwise position its arm 52 will cam lock bail 36 slightly to the right as viewed in Fig. 1, bail 36 immediately returning to engagement with the edge of the depressed slide 17 when arm 52 of the operated lever 23 has been drawn clear of flange 51. Thus flange 51 will block the return path of arm 52 of lever 23 and when lock bail 36 has entered the alignment of notches 31 the lower edge of flange 51 will fully overlie the upper end of arm 52 of lever 23 and will maintain lever 23 in operated position, which is its counterclockwise position.

Each of the signal transmission controlling levers 23 is also provided with an upstanding arm 53 the upper end of which is normally presented to the left and in blocking relation to one of two projections at the lower end of a transmitting contact lever 54 of which there is one associated with each of the signal transmission controlling levers 23. The transmitting contact levers 54 are pivoted at 56 and each lever 54 carries at its upper end an insulating cap 57 which engages an individual transmitting contact spring 58. When the lever 54 is in normal position it holds the contact spring 58 out of engagement with a facsimile signal transmitting drum 59. The transmitting drum 59 may be similar to that shown in Patent 2,046,328 granted July 7, 1936 to Edward E. Kleinschmidt et al. Drum 59 may be rotatable continuously or may be operable upon the start-stop principle, being released for one revolution upon each operation of a key lever 13 in well-known manner.

As previously mentioned each of the transmitting contact control levers 54 has two latching or detent projections at its lower end, one of which is normally blocked by the projection 53 of the associated signal transmission control lever 23. The other of the detent projections is normally engaged and blocked by a bail 61 carried by arms 62 pivoted at 63. Shaft 64, to which transmitting drum 59 is fixed, has secured thereto a cam 66. The periphery of cam 66 is engaged by follower rollers 67 and 68 carried by cam follower levers 69 and 71, respectively, pivoted at 72. Cam follower lever 71 pivotally engages the rearmost end (right-hand end as viewed in Figs. 1 and 2) of the link 48 which engages, by means of slots 46 and 47, the pins 42 and 43 respectively, carried by the lock bail arms 33 and 37, respectively, all as previously described. Intermediate its ends the link 48 is provided with an elongated slot 73 through which extends a pin 74 carried by a link 76 which is pivotally connected to the cam follower lever 69. By virtue of slot 73 and pin 74 link 76 is supported in the desired position and either of the links 48 and 76 may be moved independently of the other.

One of the arms 62 which supports bail 61 has a sloping surface disposed in the path of pin 74, so that when link 76 is moved rightwardly as viewed in Fig. 1 pin 74 will engage the sloping surface of arm 62 and will cam the arm in counterclockwise direction, thus withdrawing bail 61 from blocking relation to the transmitting contact levers 54. Upon the return of link 76 and its pin 74 ball 61 is permitted to return to normal position as by springs (not shown). Link 76 supports at its foremost end (left-hand end as viewed in Fig. 1) a restoring bail 77 which engages all of the transmitting contact levers 54 as link 76 is moved to its operated position and holds them in position to be latched by the projection 53 of the signal transmission control lever 23 and by the bail 61.

The operation of the keyboard mechanism has heretofore been described up to the point where one of the signal transmission control levers 23 has been depressed and held in the operated position by the depending flange 51 of lock bail 36, which has also locked all of the slides 17, the upstanding projection 53 on the operated signal transmission control lever 23 having been withdrawn from blocking relation to its associated transmitting contact lever 54, which remains held by bail 61. Regardless of whether the transmitting cylinder 59 operates upon the start-stop principle, in which case the position of cam 66 may be taken as indicating the stop position, or whether the transmitting drum 59 rotates continuously, the secondary hold upon the selected transmitting contact lever 54; namely, that of bail 61 will not be released until cam 66 has operated follower lever 69. As the apex of cam 66 approaches follower roller 67, the roller will be moved rightwardly as viewed in Fig. 1 and follower lever 69 will be rocked in clockwise direction. Pin 74 will be moved rightwardly and will cam bail arm 62 in counterclockwise direction thus withdrawing bail 61 from blocking relation to all of the transmitting contact levers 54. However, restoring bail 77 is also moved rightwardly since it is carried by link 76 which carries pin 74, so that the selected one of the transmitting contact levers 54 and all others will be held by bail 77, all except the selected one of the transmitting contact levers also being blocked against clockwise rotation by the projections 53 of unselected signal transmission control levers 23.

As the apex of cam 66 passes roller 67, follower lever 69 is permitted to return to its normal or extreme counterclockwise position. Such return is accompanied by movement of restoring bail 77 leftwardly as viewed in Fig. 1 and return of arms 62 which support bail 61 to extreme clockwise position. Since the purpose of cam follower lever 69 controlled by cam 66 is to control the ultimate release of a transmitting contact

lever 54 and therefore the timing of the engagement of a contact 58 with drum 59 as well as to effect the restoration of a previously selected transmitting contact lever 54, it is necessary that the bail 61 shall not move into blocking relation to the transmitting contact levers 54 until the restoring bail 77 has returned toward its normal position a sufficient distance to permit the selected one of the transmitting contact levers 54 to escape from the bail 61; that is, for the selected one of the transmitting contact levers 54 to have moved sufficiently in clockwise direction that its secondary latching projection at the lower end thereof will have moved slightly to the left, as viewed in Fig. 1, of the position in which bail 61 blocks the secondary projections of the unselected transmitting contact levers 54. This operating requirement necessitates that bail 61 shall not have returned to blocking relation to the transmitting contact levers 54 until restoring bail 77 shall have been drawn clear of the unselected levers 54. This relationship may be established by properly selecting the distance that pin 74 shall travel before it engages the sloping portion of bail supporting arm 62 and the slope of the surface which pin 74 engages.

It will be apparent that since bail 61 does not move into blocking relation to unselected ones of the transmitting contact levers 54 until restoring bail 77 has been drawn clear, the bail 61 will be drawn out of blocking relation to the transmitting contact levers 54 before bail 77 engages those levers during clockwise movement of cam follower lever 69 by cam 66. The distance through which transmitting contact levers 54 or a selected one of them may move clockwise to engage rightwardly moving bail 77 at the instant that bail 61 is withdrawn should not be enough to permit the associated transmitting contact 58 to come into engagement with drum 59, unless the drum is provided in the peripheral portions which a transmitting contact 58 would engage at the time with non-signal transmitting areas, so that no false signals will be applied to the communication channel.

As will be observed by reference to Fig. 1 the cam follower rollers 67 and 68 are very close together and since both are operated by cam 66 the operation of cam follower lever 71 will lag only slightly behind that of cam follower lever 69. The cam follower lever 71 moves its link 48 rightwardly as viewed in Fig. 1 to withdraw lock bail 36 clear of the alignment of notches 31 in slide 17, and to draw lock bail 32 into the alignment of notches 28 on the opposite sides of slide 17. When cam follower lever 71 has been rocked to extreme clockwise position by the apex of cam 66, lock bail 36 has been retracted into position where its obliquely extending blade 39 is blocked by universal bail 41. The reason for locking the slides 17 by means of the lock bail 32 at the time that lock bail 36 is withdrawn is that the operation of cam follower lever 71 overlaps the operation of cam follower lever 69 and bail 61 may be out of blocking relation to the transmitting contact levers 54 at the time that lock bail 36 is drawn free of slides 17. If at this critical instant another of the key levers 13 should be operated its associated transmitting contact lever 54 would immediately be released by its signal transmitting control lever 23 and permitted by restoring bail 77 to move clear of the blocking position of bail 61 then in process of returning to normal position. Thus, two transmitting contacts might be permitted to engage the drum 59 at the same time, resulting in superposed unintelligible signals. The lock bail 32 is withdrawn from the alignment of notches 28 to unlock the keyboard mechanism for the next operation upon the return of cam follower lever 71 and link 48 to normal position, lock bail 36 being prevented from moving into locking relation to the slides 17 by universal bail 41. Slot 47 in link 48 permits lock bail 36 to remain stationary while lock bail 32 is moved to normal position.

Upon the restoration of lock bail 36 to normal position its depending flange 51 is drawn clear of the projection 52 of the selected signal transmission control lever 23, which is prevented from returning to its full normal position, however, by its associated transmitting contact lever 54 which has been rocked clockwise by its transmitting contact 58 and therefore interferes with the projection 53 of the signal transmission control lever 23.

As soon as the lock bail 32 has been moved clear of the slides 17, another key lever 13 may be operated to prepare for the transmission of the next signal combination. This will not interfere in any way with the completion of the signal combination which is then in process of transmission by virtue of engagement of one of the transmitting contacts 58 with drum 59, as the only immediate effect will be to depress another of the signal transmission control levers 23 which will be held depressed by the bail 36, which will again lock the slides 17.

If the transmitting drum 59 is operable upon the start-stop principle and another key lever has been depressed, the drum will not be arrested at the completion of a cycle but will continue to rotate for execution of the next cycle and the transmission of the signal combination representing the key lever depressed. If another key lever has not been depressed, the drum 59 will be arrested at the completion of the transmission of the signal combination for the last key lever depressed. If on the other hand the drum 59 rotates continuously, the cam 66 will again operate the cam follower lever 69 whether or not a key lever has been depressed. As the cam follower lever 69 is rocked to extreme clockwise position, bail 61 will be withdrawn from engagement with the bank of transmitting contact levers 54 and restoring bail 77 will be moved rightwardly as viewed in Fig. 1 to restore that one of the transmitting contact levers 54 corresponding to the signal combination just transmitted to normal position with its lower end to the right, as viewed in Fig. 1, of the projection 53 of the associated signal transmission control lever 23. This permits that signal transmission control lever to return to normal position in blocking relation to its transmitting contact lever 54 so that when bails 61 and 77 return to normal position the transmitting contact lever 54 will be held by the bail 61.

Assuming, as previously mentioned, that another key lever had been depressed while a signal combination was being transmitted, the transmitting contact lever 54 associated with that key lever will escape from normal position before the return of bail 61 to normal position, due to the fact that is associated signal transmission control lever 23 is held in depressed or operated position by the depending flange 51 of lock bail 36. Thus, the transmission of another signal combination will be initiated. Immediately after the operation of cam follower 69, cam follower lever 71 will be operated to withdraw lock bail

36 and momentarily lock the slides 17 with bail 32, thereafter to remove bail 32 from locking relation to slides 17. In each cycle of transmitting drum 59, cam follower levers 69 and 71 will be operated whether or not a key lever has been depressed. The effect of operation of cam follower lever 69 if no key lever has been depressed will be merely to disengage bail 61 from and reengage it with transmitting contact levers 54 and to operate restoring bail 77 idly. The only effect of operation of cam follower lever 71 will be to lock momentarily the slides 17 by lock bail 32, since lock bail 36 is held clear of slides 17 by universal bail 41.

Although reference has been made throughout the description to one cam 66, one cam follower lever 69 and 71, it will be understood that since cam follower lever 69 operates bails 61 and 77, both of which extend across the entire bank of transmitting contact levers, and since cam follower lever 71 operates lock bails 32 and 36 which extend across the entire bank of slides 17, it may be found desirable to provide a cam 66 and follower levers 69 and 71, arm 62 for supporting bail 61 and links 48 and 76 at each end of the transmitting drum 59 so that operating power will be applied uniformly at both ends of all of the bails.

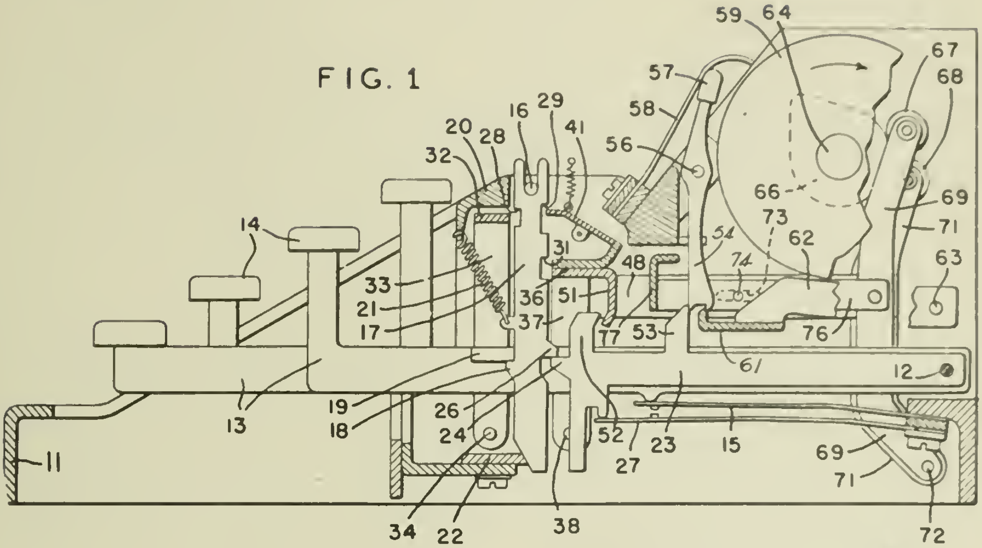
OTTO STEINER.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

O. STEINER
TELEGRAPH TRANSMITTER
Filed Aug. 8, 1941

Serial No.
405,985

FIG. 1



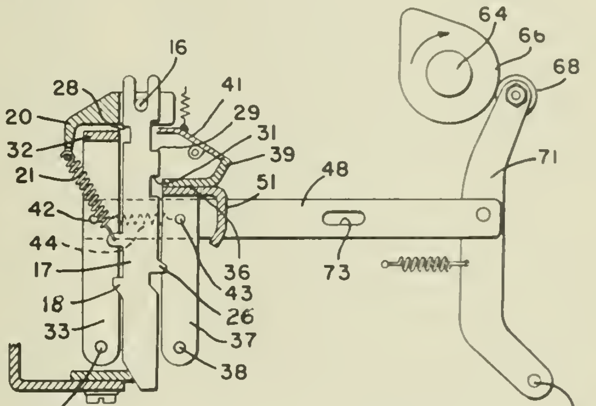


FIG. 2

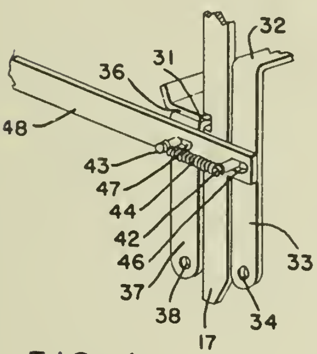


FIG. 4

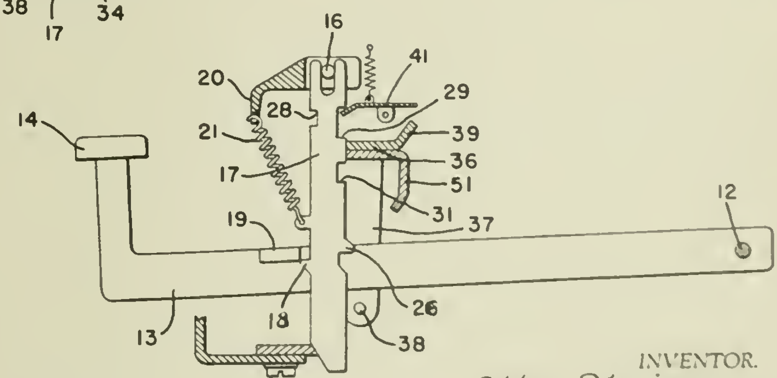


FIG. 3

INVENTOR.
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Published May 18, 1943

Serial No. 405,986

ALIEN PROPERTY CUSTODIAN

KEYBOARD FACSIMILE TRANSMITTER

Kurt Winkelmann, Berlin-Zehlendorf, Germany; vested in the Alien Property Custodian

Application filed August 8, 1941

This invention relates to printing telegraph systems, and more particularly to telegraph systems and apparatus adapted to be operated under the control of key levers.

In telegraph systems involving apparatus for recording characters by a series of elemental areas of positive and negative surfaces, transmitting apparatus have been employed wherein each letter, symbol, or character is analyzed into a succession of constituent areas, and a code set of corresponding character embodiments are constructed, which embodiments then are selected under control of a keyboard. In accordance with such scanned or analyzed embodiments, electrical impulses are generated which cause corresponding operation of recording apparatus of the form disclosed in U. S. Patent No. 2,000,083 to form the characters in line.

The principal object of the invention is to provide a key controlled facsimile telegraph transmitter having facilities for signal storage.

Another object of the invention is to provide a keyboard facsimile transmitter having a plurality of signal storage drums and means for controlling the movement of said drums from the key operated signal storing position to the constantly operating transmitting position.

The above and other objects of the invention are achieved through the provision of a novel keyboard mechanism for controlling sensing members associated with constantly rotating code discs, and a plurality of accumulator drums for permitting the simultaneous operation of both said keyboard and said scanning mechanisms. The transmitter may be so arranged that on each of several accumulator drums there may be accumulated a word or a large number of individual characters. Another feature of the invention permits the providing of three accumulator drums which are rotatable about their own axes and in addition, can be swung about a common axis. These three accumulator drums may assume four positions, one of which corresponds to the key operating position. Another corresponds to the scanning position and the two remaining are waiting positions which lie between the key striking or operating position and the scanning position.

A better understanding of the present invention may be had from the following description taken in conjunction with the accompanying drawing in which

Fig. 1 shows a schematic side view of the transmitter according to the present invention;

Fig. 2 is a view of the accumulator drum according to the invention;

Fig. 3 is an end view, partially in section, of the accumulator drum;

Fig. 4 is a schematic plan view of the transmitter; and

Fig. 5 is a view showing the advancing mechanism for the accumulator drums.

Having reference to Fig. 1, a plurality of key levers 11 are pivotally mounted on a pivot rod 12, and are guided in their oscillatory movement by a guide comb member 13. Extending underneath all of the key levers 11 is a universal bar 14 which is normally urged upwardly by springs 15. To the bar 14 is fastened a pawl 16, which is operable between two guides 17 and 18, and is under the influence of a leaf spring 19.

Pivotally articulated to each key lever 11 is one end of a link 21, the other end of which is pivotally articulated to the horizontal arm of a bell crank lever 22. Bell crank levers 22 are pivoted on a common pivot rod 23. The levers 22 cooperate with the accumulator drums or storage devices 24, 25, and 26, and for this purpose, each of the levers 22 is provided with a projection 27.

The accumulator drums or storage devices 24, 25, and 26 are provided with a plurality of rows of accumulator segments or elements 28, which are adapted to be slidable in longitudinal grooves 29 provided in the periphery of the drums. Each of the elements 28 is provided with a beveled edge 31 which co-operates with the projection 27 of its associated bell crank 22, so that when the bell crank 22 is operated by its key lever 11, a camming action will result between projection 27 and the beveled surface 31, so as to cam or urge the element 28 operated upon rightwardly (as viewed in Fig. 2) to indicate a selected position. There are provided as many accumulator segments 28 in each longitudinal row as there are key levers 11. On the peripheral surface of the drum there are enough longitudinal rows of accumulator segments to provide for all possible words which may be accumulated on an accumulator drum. In the specific embodiment shown, the accumulator drum has sixteen such rows of segments. The segments 28 are held by detent pins 32 (Fig. 3) which extend into the notch 33. The segments 28 in their shifted position in the slot 29 designate or characterize the

letters selected in that particular series or longitudinal row of segments. A comb 34 (Fig. 2) cooperating with the segments 28 may be used for returning the segments 28 to their normal position after the segments have been scanned by the scanning drum 35. Comb 34 has teeth 36 which may engage with the side surfaces of the segment 28 at a certain angular position of the storage or accumulator drums 24, 25, or 26. Such position is indicated in Fig. 2 for a certain series of segments 28, only the designated segment or selected segment is returned, while the other segments are already in their normal position.

As indicated in Fig. 1, the storage cylinders 24, 25, and 26 are not only rotatable about their own axes or shafts 37, 38, and 39, respectiveily, but are also capable of rotation, as will presently appear, about a central shaft 41. Each accumulator drum 24, 25, or 26 may assume four positions; namely, a setting or selecting position indicated by the position of cylinder 24 in Fig. 1, a waiting position which is not shown by any drum in Fig. 1 but which would be the vacant position below shaft 41 to which the cylinder 24 indicated in Fig. 1 may be rotated. The next position is the scanning position which is illustrated in Fig. 1 by the accumulator drum 26, and a waiting position which is assumed in Fig. 1 by the drum 25. Each of the drums 24, 25, and 26 are independently supported at their ends by a pair of supporting bars 42 and 43 rotatably mounted on the shaft 41. Members 42 and 43 are held in proper spaced relation by a spacing member 44. Members 42 and 43 are freely rotatable on shaft 41, which is fixedly carried in side frames 45 and 46. Drums 24, 25, and 26 carry in their ends sleeve members 47 and 48, which are slidable therein, each of said sleeves having a flange 49 which cooperates with a camming member or guide 51 fixed to a sleeve 52 secured to the fixed shaft 41. Normally, sleeves 47 and 48 are adapted by spring means (not shown) to be pulled or retracted a predetermined extent into the drum portion 26 and by cooperation between the flanges 49 and cam guide 51, as will presently appear, the sleeves 47 and 48 are adapted to be drawn out or extended against the action of its retractile spring to bring pin 53 into cooperative engagement with portions 55, 56, 57 or 58 of a disc member 54. The cam plate or guide 51 extends around sleeve 52 and is so conformed on the face thereof that sleeves 47 and 48 of the respective drums 24, 25 and 26 are held retracted in the setting and scanning positions exemplified in Fig. 1 by drums 24 and 26, respectively, thus holding pins 53 out of engagement with disc 54. Moreover, the conformation of cam guide 51 is such as to cause sleeves 47 and 48 to be extended in the waiting positions (exemplified by drum 25 in one waiting position) to bring pins 53 into cooperative engagement with portions 55, 56, 57 or 58 of disc 54.

Thus, when disc 54 is rotated (in a manner hereinafter described), the drums 24, 25 or 26 which have their pins 53 projected into the path of portions 55, 56, 57 and 58 will be correspondingly revolved about shaft 41. Since the portions 55, 56, 57 or 58 and pins 53 are in cooperative engagement with each other only in the waiting positions, only those drums 24, 25 and 26 which are in a waiting position will be moved positively by portions 55, 56, 57 and 58. Hence, when there is another drum ahead of the drum in a waiting position, supporting bars 42 and 43 of the drum in the waiting position will press against the corresponding bars 42 and 43 of the next drum and will also carry this drum along. In the embodiment shown in Fig. 1, the drum 25 in the upper waiting position will be positively driven by disc 54, while drum 24 in the setting position will be driven by drum 25.

Disc 54 of which there is one at each end of shaft 41 is loosely mounted on shaft 41 and comprises a part of a Geneva movement. Disc 54 is provided on one face thereof with a series of cam portions 55, 56, 57, and 58 arranged 90° apart. (Figs. 4 and 5.) On the opposite face thereof disc 54 is provided with two channels 59 and 61 arranged at right angles to each other which cooperate with a stud 62 integral with a lever 63 fixed to a shaft 64 journaled in the side frames 45 and 46, respectively. Control lever 63 is integral with the driven portion 65 of a grab or toothed clutch indicated generally as 66, the driving portion 67 of which is fixed to the shaft 64. To the opposite end of shaft 64 is fixed a gear 68 which meshes with a gear 69 fixed to the shaft 71 on which the scanning drum 72 is carried. The driven clutch member 65 is provided with a cam portion 73 adapted to cooperate with a pin 74, which is carried by the side frame 46 in a manner not shown. As will presently appear, the scanning drum 72 is constantly rotating and hence gear 69 rotates continuously as does the gear 68. Accordingly, the driving portion 65 of clutch 66 is constantly rotating. In a manner not shown, the pin 74 is adapted to be moved out of engagement with the cam portion 73 by the operation of the space key lever, thereby permitting the driven portion 65 under spring pressure to be urged leftwardly (as viewed in Fig. 4) into engagement with the driving portion 67, thus initiating rotation of the lever 63. Upon rotation of lever 63, the projection 62 thereon enters the groove 61 (Fig. 5) to cause the rotation of the disc 54 through 90°. By this operation one of the cam portions 55, 56, 57, and 58 will cooperate with any of the pins 53 in the aforementioned waiting positions which are projected into the path thereof to cause the rotation of the accumulator drum associated therewith about the shaft 41 a distance of 90°.

The transmitting drum 35 comprises a plurality of scanning discs having their peripheries formed as shown in U. S. Patent No. 2,000,083. Of course, any equivalent method of providing alphabet patterns of conducting and insulating areas around the periphery may be employed. Associated with each disc on the transmitting drum 35 is a scanning contact or spring 75 which is secured to an insulating bar 76 and is continuously applied to the transmitting drum 35. Mounted on shaft 71 adjacent to the scanning cylinder 35 are a pair of similar cams 76 and 77 which cooperate with a follower lever 79 which is pivotally mounted on a shaft or pivot rod 81. Levers 79 are normally biased into contactual engagement with their respective cams 77 or 76 by biasing springs 82. Accordingly, levers 79 follow the contour of their cams 76 or 77 for each revolution of the scanning drum 35. The levers 79 are connected to each other by an insulating bar 83. Carried on the insulating bar 83 are a plurality of pairs of contact spring members 84 and 85, one pair for each scanning disc on the transmitting drum 35. When the levers 79 are swung clockwise by their cams 76 and 77, a projection 86 is brought against the operated segment 28 of the corresponding accumulator drum and contacts 84 and 85 are closed so that the selected symbol is transmitted.

The operation of the device according to the

present invention is as follows: At the beginning of the transmitting cycle or process, one of the drums 24, 25, or 26 is in the setting or selecting position, which in the present instance is exemplified by drum 24. Drum 24 is detented or maintained in the position shown by detent means not shown. In Fig. 1 the key lever 11 is shown in its depressed or operated position. Thus, when the key lever is depressed from the normal dotted line position to the solid line position, it acts through link 21 to rotate bell crank 22 about pivot 23 to bring the projection 27 against the sloping surface 31 of the element 28 in register therewith, to cause the element 28 to be shifted, rightwardly, as indicated in Fig. 2, thus producing the space 29, and placing the element 28 in the proper position for operating the scanning contacts 84 and 85, as will presently appear.

Simultaneously, the universal bar 14 is lowered against the compressive action of springs 15, thus bringing the pawl member 16 into cooperative relation with the ratchet 87 associated with the drum 24. Upon its release, the key lever is raised to its dotted line position by the spring 15, through the instrumentality of bar 14. Also, through link 21 bell crank 22 is rotated clockwise to bring the projection 27 out of engagement with the element 28 which it has just operated. At the same time, pawl 16 is raised, and being guided by the members 17 and 18, it engages a tooth on the ratchet 87 to rotate the drum 24 counter-clockwise one angular step, bringing the next row of elements 28 into cooperative relation with the alignment of projections 28 on the series of bell cranks 22. Then upon another operation of a key lever 11, an element 28 is shifted to its operative position by the associated bell crank 22.

Thus, it is seen that upon successive operations of the key lever 11 one element in each row is selected, representing one letter of a word in the present instance. According to the specific embodiment shown, there are sixteen rows of elements 28, thereby enabling the setting on a cylinder of words up to sixteen characters in length. After setting up a word on a cylinder or drum, such as 24, the space key is operated which acts to disengage the pin 74 (Fig. 4) from the cam surface 73 of the clutch 66, thus permitting engagement of the driving portion 67 with the driven portion 65 thereon to cause the control lever 63 to rotate, whereby, through pin 64 and grooves 59 or 61, the disc 54 is rotated 90°. In this manner, after releasing the detent for the cylinder or drum 24 (not shown), the drum 24 is rotated clockwise about the shaft 41, a distance of 90° into the lower waiting position. At the same time, the drum 25 in the upper waiting position may be rotated to the setting position and if the drum 26 in the scanning position has completed the transmission of the word set up therein, it may be moved to the upper waiting position. The drum 24 may then be moved to the scanning position which is that position exemplified in Fig. 1 by the drum 26. The cylinders or drums 24, 25, and 26 are provided internally thereof with a spring (not shown) whereby as the scanning cylinders or drums 24, 25, 26 are rotated step by step, the spring is wound up so that after the cylinders are transferred from one position to another, they are automatically returned to the zero or beginning-of-word position.

Thus, upon movement of drum 24 into the lower waiting position, the holding pawl which has held the accumulator drum against counterrotation is released (in a manner not shown), to permit drum 24 to rotate about shaft 37 back to its zero position. Disc 54 always rotates when no accumulator drum is "scanned" in the scanning position, because pin 74 as a function of the segment corresponding to the space symbol releases the clutch 66 for operation until an accumulator drum has been swung or advanced into the scanning position. Upon swinging accumulator drum 24 into the lower waiting position, the flanges 49 slide against the fixed cam guide plate 51. Sleeves 47 and 48 are moved or pulled outwardly by the conformation of guide 51 thereby placing its retractile spring under tension and moves its pin 53 outwardly. The accumulator drum 24 upon movement of disc 54 is rotated another 90°. The accumulator drum 26 is carried along, and from the scanning position it reaches the upper waiting position. Now, the accumulator drum 4 is again in the scanning position. By a device not shown, coupling of clutch 66 is accomplished at the moment when the transmitting drum 35 is in its zero position so that at the moment when an accumulator drum 24, 25 or 26 is swung into the scanning position, the contacts 84 and 85 are held, by the action of spring 82 upon lever 79, in their open or leftward position, thus holding projection 86 out of the path of elements 28.

The setting of additional words or text may take place on drums 25 and 26 while the words or text accumulated on drum 24 is transmitted by the transmitting drum 35. The transmitting drum 35 rotates, and through levers 79, against the action of spring 82, the bar 83 moves contact members 84 and 85 against the drum 24, 25, or 26 in the scanning position. At the point at which a segment 28 is selectively displaced, the projection 86 is applied against this segment so that the contacts are closed and the corresponding symbol is transmitted. At the end of the cycle of rotation of cam 77, levers 79 are actuated counterclockwise by springs 82, whereby projection 86 is lifted away from the segment 28 of the drum in the scanning position, and accordingly the contacts 84 and 85 are opened, and in a manner not shown, drum 26 is advanced or rotated on its shaft 39 by one tooth by means of the pawl 87 and is held counter to the action of the wind-up spring by a holding pawl not shown. This process is repeated as long as accumulated symbols are present on the drum 26. As soon as the space symbol on the drum 26 has been scanned, however, the pawl 87, in a manner not shown, is made to disengage, and the coupling 66 is engaged so that the disc 54 of the Geneva movement is advanced through 90°.

When the drum 26, for example, is swung out of the scanning position into the upper waiting position, the comb member 34 is operated so that when the drum turns back to its zero position, element 28 can be set back by the teeth 36. When the adjustment or selection takes place so rapidly that no drum 24, 25, or 26 is in the waiting position, exemplified in Fig. 1 by the drum 25, a key block or locking arrangement of familiar type is actuated in a manner not shown by means of which the keys 11 are blocked until a drum is ready for adjusting or setting.

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PUBLISHED
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BY A. P. C.

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2 Sheets-Sheet 1

FIG. 1

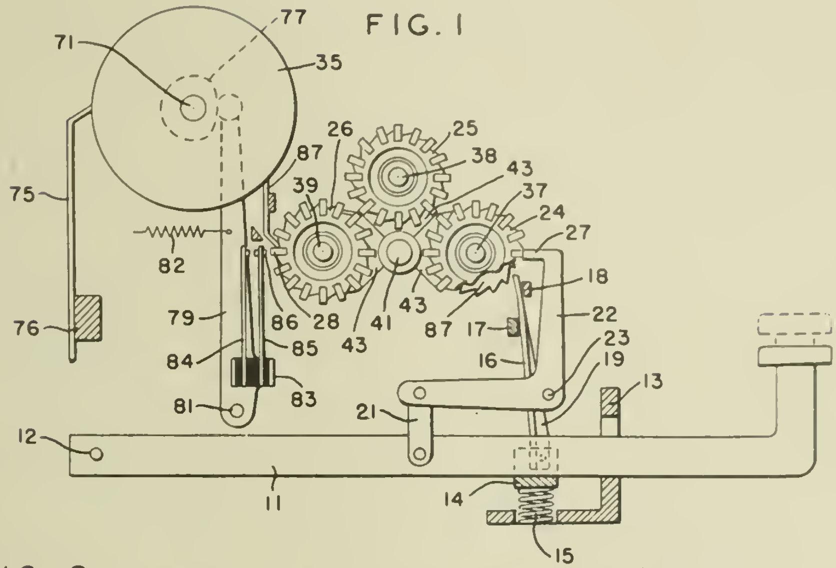
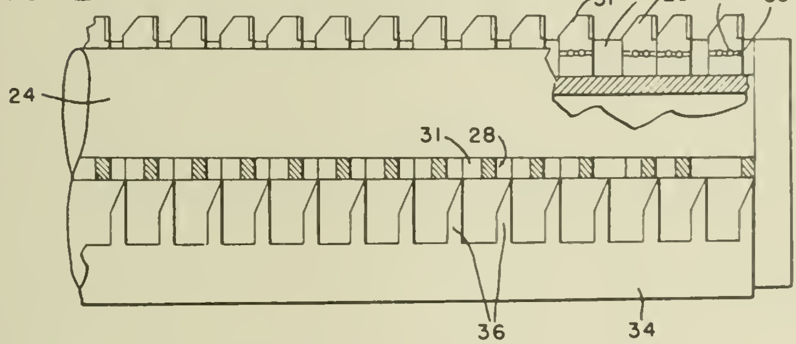


FIG. 2



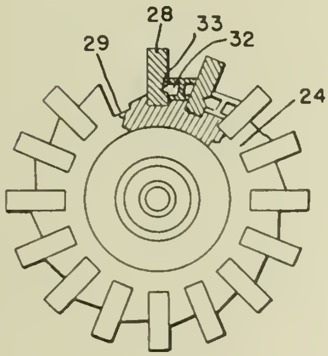


FIG. 3

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FIG. 4

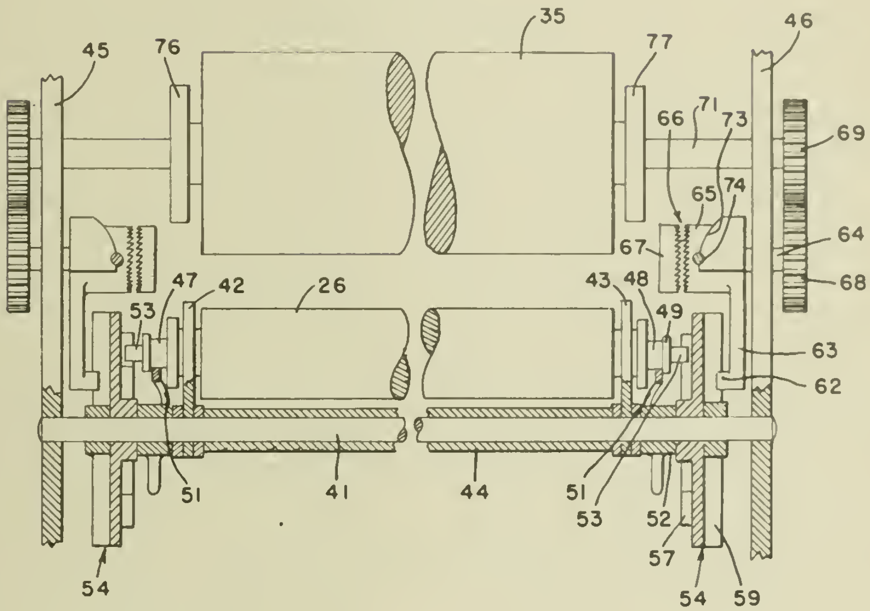
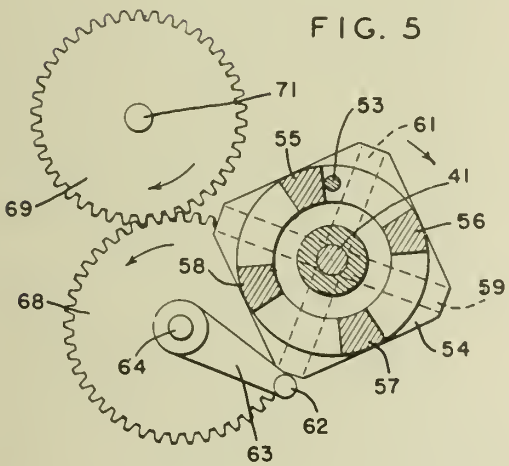


FIG. 5



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ALIEN PROPERTY CUSTODIAN

CURRENT COLLECTORS FOR ELECTRIC VEHICLES

Ferenc Szalay, Budapest, Hungary; vested in the Alien Property Custodian

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The sliding shoes or trolleys of the current collectors of the known types are liable to dewirement (to jump off the overhead wires) whilst running, in which case the spring urging the current collector against the overhead wires raises the current collector around the horizontal axis. This will cause the upper end of the current-collector pole to project above the overhead wire, in consequence whereof the trolley pole will seriously damage, any overhead wires getting into its way as well as any suspension wires of the overhead net. A further drawback is that the pole of the current collector which has dewired will swing out freely around the vertical axis of the trolley base and will perform a mowing-like motion, thus damaging any such wires or other subjects as may be situated sideways from the overhead wires. Any defects, thus arisen, can only be amended by means of lengthy and expensive repairs, whilst, high-tension wires crashing down also may cause a danger of life.

In order to eliminate the drawbacks enumerated, a device is provided on the current collector according to the invention wherein the trolley pole is propped in its working position, by a device being operated by an electric and/or mechanical apparatus and wherein further a pivot is provided on the trolley pole or on its support around which said pole will, as soon as the propping device is released, snap down to a level lower than that of the overhead wires.

In one embodiment of the invention, the pivot is provided on the lower end of the trolley pole and the pole is equipped with an intermediate carrying member by means of which the lifting spring is connected with the pole through the releasable propping member.

In another embodiment of the invention, the trolley pole is divided into sections by at least one pivot and the propping device keeps the sections of the divided pole in working position.

In a third embodiment of the invention, the lifting spring or springs of the current collector urging the trolley pole against the overhead wires are released by means of an oil or air dashpot and/or of a counter-spring, the operation of which being effected by means of an electromagnet and/or an electric motor and/or compressed air.

The re-setting of the released mechanism is effected by lifting the trolley pole above its highest working position, during which procedure the counterspring or some other pressure force overcomes the force of the lifting spring and pulls the pole into working position.

In addition hereto, it is the pressure of the oil or air-dashpot that is utilized also for braking the rotation of the trolley pole around a vertical axis, so as to prevent any damage which might be caused by the lateral movements of the trolley pole i. e. by the mowing-like motion.

The invention will now be described by way of examples with reference to the accompanying drawing, in which:

Fig. 1 is one form of the current collector arrangement in accordance with the invention, in which the link divides the pole into two sections and in which the snapping down of the pole around the pivot is effected by electrical means.

Fig. 2 is the trolley pole as shown in Fig. 1 in its snapped down position.

Fig. 3 is a modified arrangement of the current collector shown in Fig. 1, in which the snapping down of the trolley pole around its pivot is effected by mechanical means, with the aid of a double-arm lever.

Fig. 4 is another modified arrangement of the current collector shown in Fig. 1, in which the snapping down of the pole around its pivot is likewise effected by mechanical means, notably by releasing a spring which is compressed in its working position.

Fig. 5 shows a further modification of the current collector arrangement according to Fig. 1 partly in section in which the lever system is composed of three members.

Fig. 6 is another embodiment of the current collector arrangement according to the invention, in which the pivot is arranged at the lower end of the pole and the snapping down of the pole around this pivot is effected by electrical means.

Fig. 7 shows trolley pole according to Fig. 6 in its snapped down position.

Fig. 8 is a side elevation, and partly a section of a third embodiment of the current collector according to the invention.

Fig. 9 is a plan view of the device according to Fig. 8.

Fig. 10 is a side elevation of a modification of the current collector according to Fig. 8.

Fig. 11 is a plan view of the device shown in Fig. 10.

Fig. 12 illustrates a detail of Fig. 10 in section.

The trolley pole **1** comprises a link **23** (Fig. 1), dividing the pole into two sections 1_1 and 1_2.

The sliding shoe **8** provided at the upper end of the upper pole section 1_2 is rotatable around a vertical axis in the sleeve **9** of the pole section 1_2.

A pawl **10** is journalled in the casing joining

on to the lower pole section 1_1, whilst a lever 11 is journalled in the upper part of pole 1_2. A lifting spring tends to keep pawl 10 and lever 11 in their working positions. Lever 11 is supported on pawl 10 at a point situated inside the line connecting the pivots of lever 11 and of pawl 10, so that thereby stable propping is assured in the operating position of the trolley pole. The magnet 12 fixed on pole section 1_1 is fed by the source of current 13. The contacts 14, 15 and 16 are connected into the circuit of the magnet coil 12. Of these, contact 15 is provided at the upper end of pole section 1_2, whilst contact 14 is provided on the lever 17 joining-on in an articulate manner to pole section 1_2. The iron core of the magnet 12 is connected by means of the pulling member 20 guided around the roller 18 to the lower end of the pawl 10. In the working position of the current-collector pole the contacts 14, 15 are open, whereas contact 16 is closed. The free end of lever 17 is urged by spring 21 against the front face of pivot 22 of the sliding shoe 8 journalled in sleeve 9. By adjusting spring 21, it is possible to control the closing time of the contacts 14, 15.

The trolley pole reaches its snapped down position in the following manner according to Fig. 2:

If the sliding shoe 8 leaves the overhead wire 7, the pivot 22 of the sliding shoe 8 will, under the pulling action exerted by spring 21 on lever 17, close the contacts 14, 15. This will close the circuit of magnet 12, whereupon the pulling member 20 will draw-in the lower arm of pawl 10, whereas the upper arm of the pawl will jump out from the rest of lever 11, thereby releasing lever 11. This will result in the release of the propping device by which the pole sections 1_1, 1_2 are held together rigidly, in consequence whereof pole section 1_2 will snap down around the pivot 23. (Fig. 2).

The brake shoe 25 cooperating with the stop 24 provided in the lever arm projecting beyond the horizontal pivot 4 of the lower pole section 1_1 and the brake disc 26 arranged below the said brake shoe prevent the mowing like motion of the snapped trolley pole. Notably, when the trolley pole has left the overhead wire and spring 6 has swung the pole section 1_1 in the upward direction, the adjustable stop 24 arranged in the bent-back end of the pole section will press brake shoe 25 against disc 26. Owing to this braking it will not be possible for any movement of the trolley pole.

In order to cause the trolley pole to come back to its working position, the contact 16 is interrupted and the pulling effect exerted by the pulling member 20 on the pawl 10 will cease. The pole section 1_2 is brought into alignment with pole section 1_1, whereupon pawl 10 will catch into the rest of lever 11 and the trolley pole will regain its propped condition.

When placing the trolley pole on the overhead wire 7, it is necessary that the pole will be pulled downwards in consequence whereof the effect exerted by the adjusting screw on brake shoe 25 will cease and the whole trolley pole will become freely rotatable around the vertical pivot.

In Fig. 3 the releasing device is relayed by a double-arm lever 29 journalled on the shaft 4, the end 30 of the said lever falling within the range of operation of stop 24. At the moment when shoe 8 has left the overhead wire 7, the stop 24 will make impact by its lower end against the end 30 of the lever 29, and will press this end against brake shoe 25, whereupon brake shoe 25 will become pressed against disc 26 and will thereby prevent any rotation of the whole mechanism around pivot 2. Concurrently with the downward deflection of arm 30 of lever 29, however, the pulling member 20 will also become displaced in the direction of the arrow according to Fig. 3, and will deflect the lower arm of the pawl 10, until the upper arm of the latter will rise from the rest of lever 11 and pole section 1_2 will reach the snapped down position shown on Fig. 2.

Relaying by mechanical means can, however, as shown in Fig. 4, also be effected in a different manner. The lever 17 (Fig. 1) subject to the action of the spring 21 is, through pulling member 31 (Fig. 4) acting on arm 33 of the double-arm lever 32. The lever 32 is journalled on the cylinder 34 and its arm 35 engages through link 36 with piston-rod 39 of the piston 38 subject, in cylinder 34, to the action of spring 37. The free end of the piston rod 39 is connected with the pawl 10 by means of the pulling member 20. In the rest position of the apparatus the spring 37 is compressed, in which case the arm 35 of the double-arm lever 32 and the link 36 are in alignment with the piston rod 39.

If the shoe 8 leaves the overhead wire 7, the lever 17 will, under the action of the spring 21, pull the pulling member 31, whereupon the lever 32 will become deflected, whilst at the same time it will, together with the articulation member 36, leave the centre line of the piston rod 39, and the action exerted by the spring 37 on the piston 38 will become effective. Under the action of the spring 37, the piston 38 will, together with the piston rod 39, become displaced in such a manner that it will, through the pulling member 20, deflect the pawl 10, and will lift out the upper leg of the said pawl from the rest of the lever 11. Thereby the end 12 of the trolley pole will snap down around the pivot 23. When bringing the current-collector pole into its working position the spring 37 has, of course to be re-compressed.

The embodiment represented in Fig. 5 shows a modification of the lever system of the trolley pole illustrated in Figs. 1 to 4. In this embodiment, the lever system, in addition to the pawl 10 journalled in the sleeve 41 which is fitted with an extension piece and is arranged on the propping section 1_1, notably at its upper end, and the lever 11 journalled in the sleeve 42 which is fitted with an extension piece and is journalled on the propped section 1_2, notably at its lower end, also contains the locking bolt 43. Preferably, the pawl 10 likewise is journalled in the extension piece of the sleeve 41, and in the propped position of the pole section 1_2 one of the arms of the said pawl lays itself into the groove of the locking bolt 43, whereas on the other arm of the said pawl the lever 11 finds support by its rest. The levers 10 and 11 as well as the locking bolt 43 are subject to the action of the springs 44, 45, 46.

In this embodiment, the design of the pawl 10 and of the levers 11 is such as to ensure that in the working position of the trolley pole they should be in an unstable position promoting release; accordingly, if the pawl 10 were not kept in a fixed position by the locking bolt 43, the lever 11 would, in consequence of the pressure exerted in an eccentric direction by the lever 11 slide off immediately from the pawl 10 and the pole section 1_2 would snap down. This object is achieved by placing the point of attack of the lever 11 on the pawl 10 outside the line connecting the pivots of the pawl 10 and of the lever 11.

If a pulling effect is exerted in the direction of the arrow on the drawbar 20 connected electri-

cally or mechanically to the locking bolt **43**, the locking bolt **43** will become deflected around its pivot and release the lower arm of the pawl **10**, so that this pawl, becoming displaced, in consequence of the pressure of the lever **11**, against the action of the spring **44**, from its unstable position, will throw off the lever **11** supported on its upper arm. In consequence hereof the section 1_2 of the trolley pole will, together with the part **42**, snap down into the position shown in dotted lines.

In order to reduce the strong impact made by the pole section 1_2 when clashing against the pole section 1_1, notably against the sleeve **41** fitted with an extension piece, a rubber cushion **47** or a gas- or liquid-dashpot is provided in the extension piece of the sleeve **42**.

In other respects the operation of the propping device is entirely similar to the operation of the devices employed in the embodiment described by way of above examples.

In Figs. 6 and 7, it is on the lower end of the current-collector pole that the articulation **4** is provided, whilst the intermediate carrying member **48** is arranged on one side of the pole **1** or between its forked lower legs. This intermediate carrying member is a bell-crank lever, to one end of which there joins on the spring **6** pressing the trolley pole against the overhead wire, whilst its other end contains the stop **24** which effects the braking of the pole. The pivot of the intermediate carrying member **48** coincides with the pivot **4** of the current-collector pole **1** and in its arm subject to the action of the tensioning spring **6** there is journalled a pawl **10** engaging with the lever **11** which is arranged on the current-collector pole **1** and is subject to the action of a spring. The lower leg of the pawl **10** is connected by means of the pulling member **20** with the iron core of the magnet **12**.

If the shoe **8** leaves the overhead wire **7**, the contacts **14**, **15** are closed, the pawl **10** will become deflected in such a manner that the lever **11** will leave its rest, and the trolley pole **1** will snap down around the pivot **4** and will lay itself in its position shown in Fig. 2, on the cushion **40**. The trolley pole is brought into its working position. For this purpose, the contact **16** is interrupted, whereupon the nose of the pawl **10** will again catch into the rest of the lever **11** subject to spring action.

In the case of the embodiment according to Figs. 8–9, a dashpot **49** joins on sideways to the frame **3**. The rod **51** of the piston **50** moving in this dashpot joins on articulately to the arms **53** journalled at the end of the arm **52** projecting from the frame **3**. The arms **53** are journalling the transverse pivot **54** (Fig. 9). One end of each of the lifting springs **55** and **56**, respectively, is fastened to the two ends of this pivot, whilst the other ends of the said springs urge against the forked end of the trolley pole **1** in the vicinity of the pivot **4**. The piston rod **51** is surrounded by the counter-spring **57**, which is supported, on the one hand, on the pivot **54**, and on the other hand, on the casing of the dashpot **49**. In the working positions of the trolley pole, the action of the counterspring is weaker than the resultant of the springs **55**, **56**; notably, it may, amount to, say, between one-tenth and five-tenths of the latter.

The working point of the lifting springs **55**, **56** on the trolley pole **1** is determined by the overhead wire pressure, from the pivot **4** of the pole, and accordingly, when the trolley pole approaches the vertical position, the strength of the springs diminishes. Accordingly, it will be possible to provide for the counter-spring **57** to overcome the lifting force of the springs **55**, **56** in the highest working position of the trolley pole, in order to render the release of the lifting spring by means of pivot **54** and of piston rod **51** possible.

The lever **43** journalled on the base **3** passes through the port **64** out into the thicker part of the piston rod **51**. The lever **10** connected articulately to the upper end of the lever **43** catches into the rest of the pawl **11** pivotable around the pivot **58**, on the opposite end of which pawl the armature **20** of the electro-magnet **12** attacks. The operation of the electro-magnet **12** is effected in the manner described above.

The trolley pole snaps down in the following manner:

If the sliding shoe or trolley leaves the overhead wire, the electro-magnet **12** will draw-in its armature **20**, which latter pull down and/or strikes the longer arm of the pawl **11**, whilst the shorter arm of the pawl **11** thrusts the lever **10** from its rest.

The release of the lever **10** relays the propping lever **43**, whereupon the lifting springs **55**, **56** are thrusting the piston rod **51**, and, together with it, the piston **50** and the pivot **54** towards the axis **4**, i. e. towards the right. After this motion has been braked by the counter-spring **57** and by the dashpot **49**, it is only gradually that the lifting springs **55**, **56** will become released, and thus the trolley pole **1** will not drop freely, but will first sink rapidly below the level of the contact wire, following which it is by gradual deceleration that it will reach its horizontal position.

The mowing-like motion of the trolley pole which has jumped off the overhead wire is prevented by the brake piston **25** moving in the cavity of base **3** fitted with pivot **2**. Whilst piston **50** compresses the medium contained in dashpot **49**, the air gets through the aperture **59** into the space behind the brake piston **25**, and presses the latter against the base-plate **26**.

If the trolley pole which has jumped off is to be replaced to the overhead wire it is first necessary to make the electro-magnet **12** currentless, whereupon the pulling action exerted by the armature **20** on pawl **11** will cease and pawl **11** will, under spring action, return into its rest position. The lever **10** is brought by lever **43** into the rest of pawl **11**, whereupon the piston rod **51** is pressed back by the spring **57**, in which action the spring is aided either by raising the trolley pole **1** or by passing compressed air or liquid into the dashpot **49**. It follows from this that as soon as the trolley pole is replaced on the overhead wire, the whole operating device together with the springs are rebrought automatically in their initial positions.

The modification represented in Figs. 10–12 differs only from the embodiment shown in Figs. 8 and 9 in that the operating device and springs are arranged behind the pivot when viewed in the running direction of the car and not in front of it.

The springs **55**, **56** act on the section situated below the axis **4** of the trolley pole **1**. The opposite ends of these springs are journalled on the pivot **54** arranged on the end of the piston rod **51**. The springs **55**, **56** are holding trolley pole **1** in its operative position and are drawing pivot **54** towards axis **4**. (Figs. 10 and 11). This is prevented by the tooth or toothed wheel **61** journalled on the pivot of lever **43** and engaging with the end **60** of piston rod **51** (Fig. 5). Accordingly,

the lever **43** tends to turn in the direction of the arrow indicated on Fig. 10, but this is prevented by lever **10** connected into the rest of pawl **63** subject to spring action. The pawl **63** is deflected against spring action by lever **32**, with the co-operation of the levers **11** and **17** operated by the armature **20** of magnet **12**.

Notably, as soon as the shoe of the trolley pole **1** has left the overhead wire the magnet **12** will deflect lever **62** on the axle of lever **11** (Fig. 12), whereupon the lever **32** becomes released from lever **62** and the pawl **63** will, in consequence of the pressure of the pole **10**, become deflected in a counter-clockwise sense. In the meantime lever **10** jumps out from the rest of pawl **63**, and lever **43** will, together with tooth **61** mounted on the common axle, turn in the direction of the arrow shown in Fig. 10 and release piston rod **51**. Under the action of the springs **55**, **56**, the piston **50** will become displaced in the direction of the arrow shown in Fig. 12. This motion is resisted by the counter-spring **57** and by the medium compressed in the dashpot **49**.

In other respects the device according to Figs. 10–12, is similar to the current-collector releasing and braking device shown in Figs. 8 and 9.

Magnet **12** should preferably be constructed in such a manner as to ensure that lever **11** should exert a striking effect so that the engagement between levers **32** and **62** is released with greater safety.

For releasing the levers **32**, **62** it is also possible to employ, instead of a magnet, a number of turns of a small electric motor.

Instead of the contact switch arranged on the trolley pole, it is also possible to employ a pneumatic valve, whilst instead of the electro-magnet it is also possible to employ a compressed air cylinder.

FERENC SZALAY.

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F. SZALAY
CURRENT COLLECTORS FOR ELECTRIC VEHICLES
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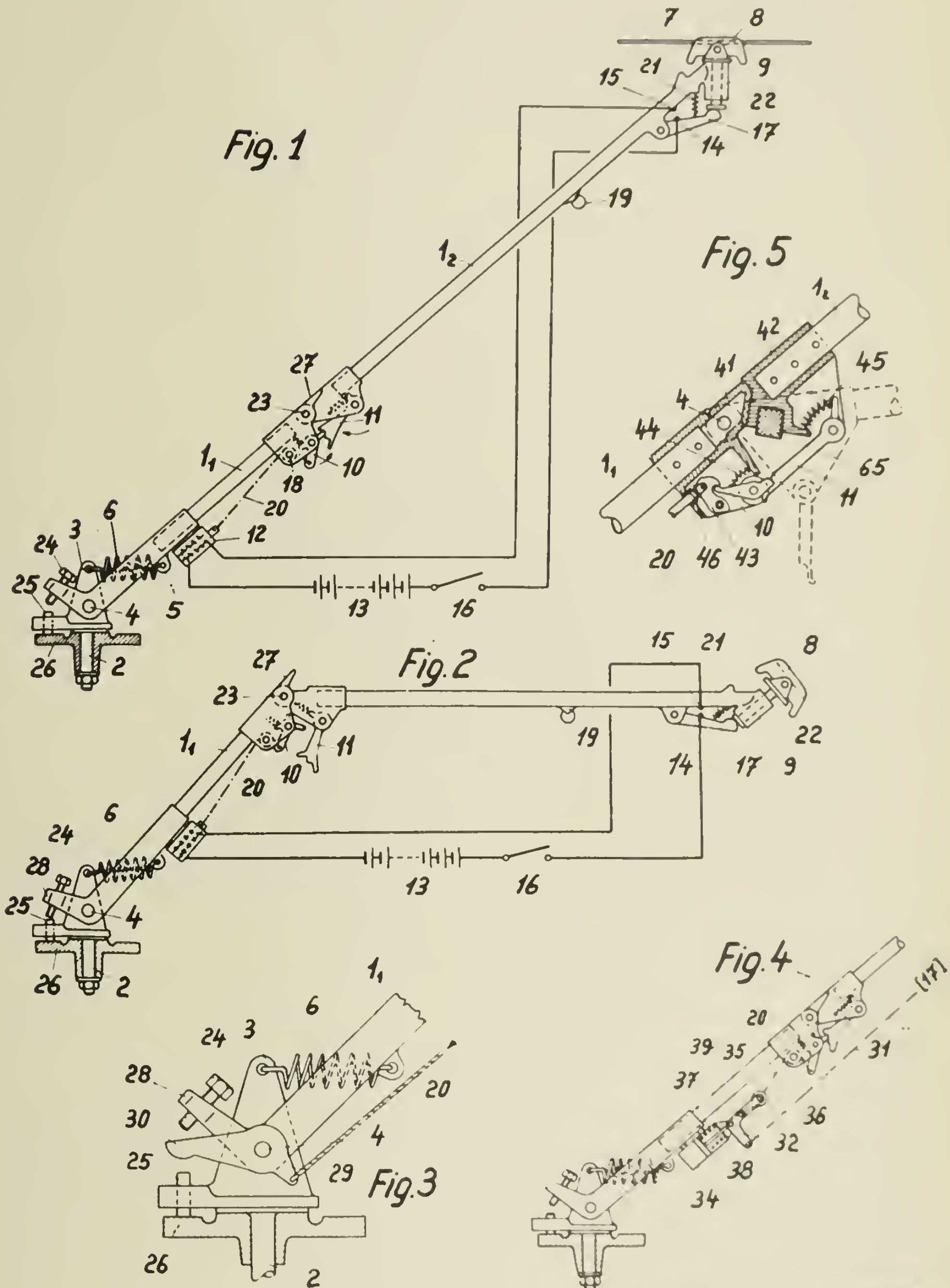

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Fig. 8

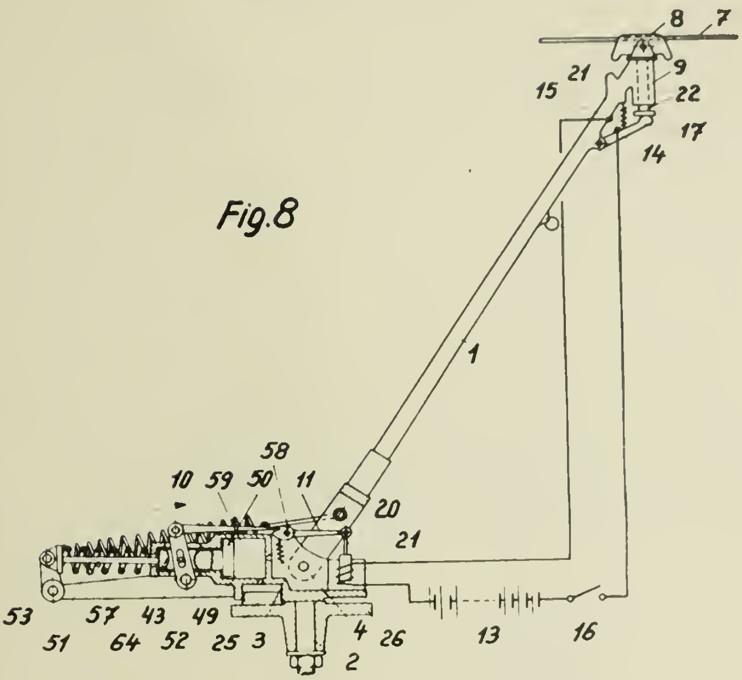

Fig. 9

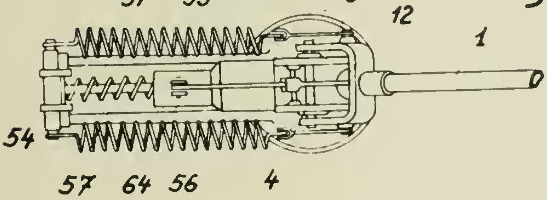

Fig. 6

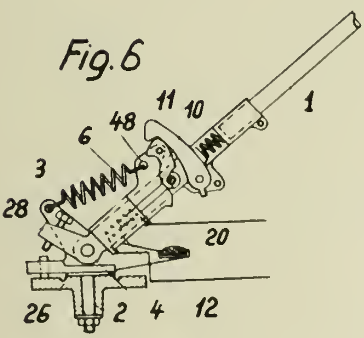

Fig. 7

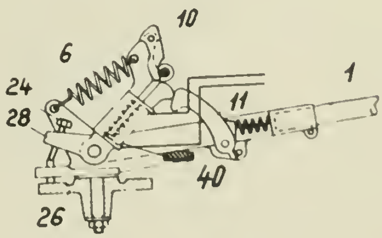

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Fig. 10.

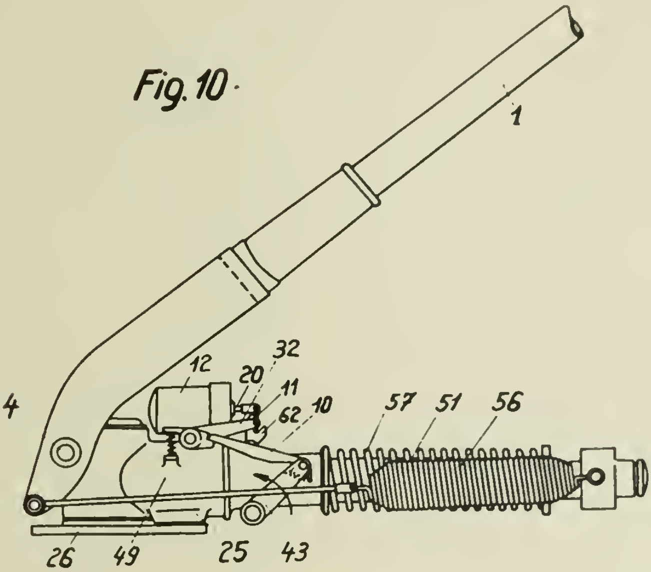


Fig. 11

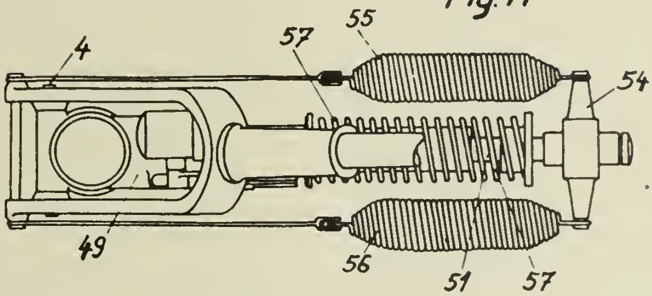
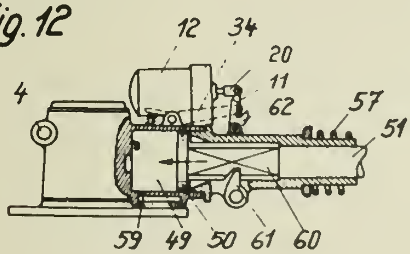


Fig. 12



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ALIEN PROPERTY CUSTODIAN

MANUFACTURE OF CABLES WITHOUT LEAD SHEATH

Wilhelm Ohnesorge, Berlin-Charlottenburg, Günter Flanze, Berlin-Lichtenrade, and Friedrich Gladenbeck, Berlin-Charlottenburg, Germany; vested in the Alien Property Custodian

Application filed August 29, 1941

The present invention relates to electric cables provided with a protective sheath applied to the cable core.

In the manufacture of cables for power and communication circuits lead, copper and in part also iron are particularly employed. Attempts have been made to reduce the amount of copper hitherto required by a more advantageous utilization of the copper conductors. The air-space insulated concentric or symmetric high-frequency cable which is utilized for carrier-current transmission forms at present the last stage of this development. In order to effect a saving in lead which is chiefly employed in the manufacture of the cable protective sheathing, the chemical industry has developed non-metallic protective means which may be applied to the lead sheath and which permit to reduce the thickness of the lead sheath to a great extent. The chemical industry has also developed non-metallic materials which may be used instead of lead for the manufacture of flexible protective sheaths.

The object of the present invention is to provide a cable in which a novel type of protective sheath applied to the cable core is employed, thus dispensing on the one hand entirely with the hitherto usual metallic protective sheathing as well as with the iron armoring and considerably reducing on the other hand also the use of metal for the inner conductors in the case of high-frequency transmission.

The nature of the invention consists in surrounding the insulated cable core by a protective sheathing which is composed of assembled rigid short tubular sectional elements of a moisture-proof and practically inflexible material such as glass, porcelain, pressed material and the like, the final connection of which takes place during or after the laying. This protective sheathing is not to constitute any part of the insulation of the cable conductors, the cable core as such being insulated• in a manner which is the same or similar to that which has hitherto been customary with lead-sheathed cables. The construction of the protective sheathing of rigid elements according to the invention provides new possibilities for building up the cable cores.

The invention will be now explained by way of example.

Tubular or shaped sectional elements of rigid (i. e. practically inflexible) and moisture-proof material may be provided at their ends with flanges or grooves. These elements replace the hitherto usual flexible protective sheath applied to the insulated cable core and are fitted together when or after laying the cables in the ground. In the case of low-frequency transmission a tubular duct is preferably first prepared by fitting the tubular or shaped sectional elements together and the insulated copper conductors bunched together (constituting the finished cable core) are then drawn into this duct. It is also possible to manufacture a number of sections of the low-frequency cable and to surround them at the same time with shaped elements of the rigid moisture-proof sheath. These elements or components of the protective sheath, provided during manufacture with the cable core parts, are placed together end to end during the laying of the cable and the connection or joining of the corresponding inner and outer parts is then proceeded with. In this case the conductors of the cable core are spliced to each other in a known manner, and the tubular or shaped elements are connected together in a moisture-proof manner so as to provide as much flexibility as possible. If the sheath is to afford in this case a protection not only against mechanical and chemical influences, but also against inductive and capacitive influences it is often convenient to render the elements of the cable sheath conductive by applying thereto a metallic layer which need not be highly conductive so that currents can flow over the surface of the cable sheath. The metallization is preferably effected in such a manner that at the points of connection of the tubular sectional elements there is attained not only a mechanical sealing but simultaneously with their connection electrical contact of the points of connection is obtained, i. e., favorable electric bridging contacts are made.

The use of the invention is particularly advantageous with cables intended for high-frequency transmission. It is only necessary, when using the sheath according to the invention, to position one or more inner conductors in the interior of the sheath in a given position by known spacers. Thus, the sheath sections with a metal layer may be provided with one or more inner conductors which are held therein by spacers in a known manner. In this case concentric or symmetric or also multiple conductor cables are obtained depending upon the construction of the cable. Since the individual cable sections need not be wound on a reel it is no longer necessary to manufacture the inner conductors of flexible material as has hitherto been the case. The inner conductors are also made according to the invention of rigid material, particularly of glass, and are provided with a metallic coating. Glass

resistant to rupture is particularly advantageous for the protective sheath and/or the supporting cores for the inner conductors. The two methods indicated above for low-frequency cables may also be adopted for high-frequency cables, i. e., the tubular sectional element may either first be laid at intervals and then the cable core drawn in, or the cable sections may be built saparately in the factory and only joined together when laying. The inner conductors may be easily connected by placing thereover small ferrules or the like. In high-frequency cables the connection of the metallized sheath may also be effected as above described.

Since flexibility, which has hitherto been necessary to permit of winding the cable on drums, can be dispensed with, according to the invention concentric or symmetrical cables can also be made by surrounding the inner conductor or conductors by a plurality of tubular pieces, in particular arranged concentrically, and which are coated on the inside or outside with metal or have been metallized in some other way.

The above-mentioned types of cables may be manufactured according to the invention in such a manner that the moisture entering the sheath space when laying the cable is removed which may be easily done, for instance, by forcing therethrough a current of dry air, moisture-absorbing gases or the like. In this case care should be taken to design the cable sheath or sheaths in such a manner as to present sufficiently large spaces and the spacers of the current carrying conductors so as to permit a free passage of the air.

It may be further pointed out that the cables manufactured according to the invention may be easily connected to cables of the hitherto usual type and may cooperate therewith without any difficulties.

Furthermore, the invention presents the advantage that the noxious formation of eddy currents is suppressed. When applying a metallic layer to rigid material which is not electrically conductive all eddy currents which do not flow in the longitudinal direction of the cable may be suppressed by subdividing the layer in a suitable manner.

It is possible that in some countries owing to earth quakes or the like the mechanical stress of the cable may attain an unduly high value. In this case the cable is embedded in a solid covering in such a manner as to be flexibly supported within the hollow body; for instance, by suspending the cable resiliently or by embedding it in a plastic or elastic compound.

In the accompanying drawings are shown some embodiments of the invention in diagrammatic form. Figs. 1 and 2 are two embodiments of the invention in which the cable cores insulated in the factory are arranged in the cable sheaths composed of tubular elements or pipe sections.

In Fig. 1, **1** denotes a pipe section provided at both ends with flanges against which abut the flanges of the adjacent pipe sections **2** and **3**. In order to make the joint of the pipe sections flexible and at the same time moisture-proof a hose coupling **4** is placed over the ends of the pipe sections, the house coupling **4** being firmly clamped thereto by means of clamps **5**. The hose coupling **4** may besides be cemented to the pipe sections in order to attain a better sealing. Furthermore, it may be protected exteriorly by placing around the hose coupling strips of sheet iron (not shown). In Fig. 1 at the right-hand joint the hose coupling **4** is shown in cross-section without clips, whereas at the left-hand joint is shown a view thereof with clamps. The cable core **6** is drawn in the usual manner into the assembled pipe composed of the pipe sections **1**, **2**, **3** etc.

In Fig. 2 the pipe section **21** is designed in the form of the known cast-iron socket pipes, the straight end of which is, for instance, provided with longitudinal ribs **24** having a length of 5 to 10 cm and the socket end of which is provided with corresponding grooves. The ribs and grooves are uniformly distributed over the periphery and serve to prevent the pipe sections from rotating and at the same time to distribute the sealing mass **25** poured into the remaining interstitial space between the two engaged pipe ends. This sealing mass may, for instance, consist of bitumen, a plastic composition or the like. The joint between the pipe section **21** and the adjacent pipe section **22** at the right is shown in cross-section, whereas at the left is shown a view of the joint between the pipe section **21** and the adjacent pipe section **23**, from which will be seen the soldering and welding material **27** serving as a seal for the joint. In order to effect the welding, the contact surfaces of the pipe sections are metallized. Also in this case the cable core **26** is protected against mechanical stresses and moisture.

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MANUFACTURE OF CABLES WITHOUT LEAD SHEATH

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Fig. 1

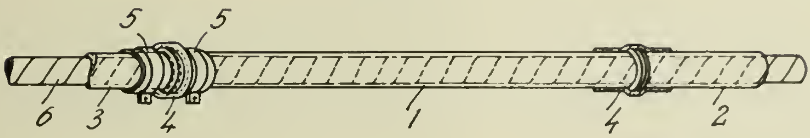
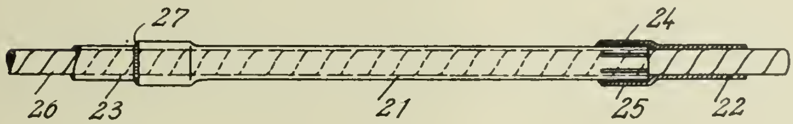


Fig. 2



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by Knight Bros attorneys

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ALIEN PROPERTY CUSTODIAN

LOUDSPEAKER

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Application filed September 5, 1941

It is already known to provide an electrodynamic loudspeaker with an arrangement serving for limiting the movement of the oscillating body beyond a certain amplitude. In a known arrangement the stop pieces are mounted at the outside of the oscillation coil and act on the outer spiral centering member. In such an arrangement a very strong outer spiral is necessary so as to withstand the stress at abutting. The required strong construction of the spiral and the increase in weight and reduction of its movability thereby entailed involve considerable drawbacks. In addition, rather considerable difficulties are encountered in mounting the known arrangement.

The arrangement according to the present invention avoids the drawbacks of the known arrangement and provides an essentially better solution which moreover is much simpler and less expensive. In addition in the arrangement according to the novel feature the distances of the limiting pieces, and thus the amplitude from which the limiting action sets in is adjustable. The essential feature according to the new idea resides in that at the narrow or small end inside the diaphragm a disk is arranged having a hole through which a bolt extends without touching the disk and which is fastened to the center pole. This bolt carries the two stop pieces which are situated on different sides of the disk. The bolt has a thread so that the distance of the abutment pieces from the abutment disk can be set.

The accompanying figure shows an example of construction embodying the novel idea. The diaphragm 1 of the electrodynamic loudspeaker is provided with an oscillation coil 5 which protrudes into the air gap 2 between the pole plate 3 and the center pole 4. The oscillation coil 5 is centered in the airgap 2 by the outer centering means 6 which is known as such. The interior of the diaphragm 1 contains in the proximity of the small end a stop disk which has a central opening 8 through which a bolt 9 is passed without coming in contact with the disk 7 whereby the said bolt is screwed into the center pole 4. The bolt 9 has screwed thereon the two stops 10 and 11. These stops are suitably cushioned with rubber designated by 12 and 13 respectively so that in this way impact noises which may be produced by the abutting and which would cause disturbances cannot appear. Obviously, it is not absolutely necessary that these stops be adjustable. The operation can also be carried out with fixed stops which have once been set. The disk 7 can be given an elastic action through hollowed out places in the material similarly to the known inner centering means, so as to absorb the impact in an elastic manner.

The new arrangement also has the essential advantage that after the correct setting of the stops and at the movements of the oscillatory coil caused by the sound frequency impulses the retractive force of the outer spiral is utilized in its linear range. Deviations of the oscillatory coil which exceed the amplitudes normally to be expected and which are produced by the noises are however limited in an unobjectionable manner. Thus the sensitive coil body is given protection against damages and the operating safety of the loudspeaker is thereby enhanced.

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A. SCHAAF

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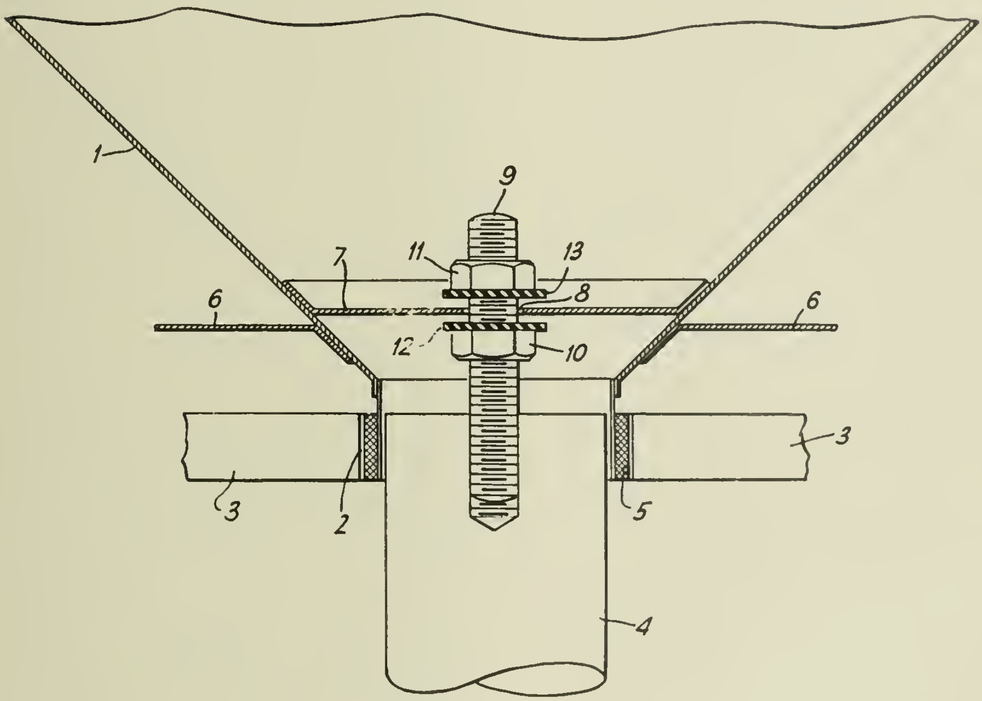

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ALIEN PROPERTY CUSTODIAN

ELECTRO-ACOUSTIC DEVICES

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The present invention relates to electro-acoustic devices and particularly to such devices for receiving and transmitting sound. More specifically, the invention relates to electro-acoustic devices the operative elements of which consist of a piston type diaphragm and an electro-mechanical system especially of the electrodynamic type connected with said diaphragm and either actuated thereby for receiving sound or itself actuating the diaphragm for transmitting sound.

An object of the present invention is to affect the resonance frequency of a piston type diaphragm so that all distorting reactions of the mechanical properties of such diaphragm upon the reception or transmission of vibrations within the acoustical range will be suppressed or avoided.

Whereas earlier electro-acoustic devices used to be provided with so-called plate diaphragms as they are still in use in telephones and microphones of all commercial telephone systems, more recently sensitive devices of this type such as radio microphones, loudspeakers and the like, are provided with so-called piston type diaphragms, that is, diaphragms having a stiff active surface which are elastically suspended merely along their edge so as to vibrate as a unit similar to a piston.

Whereas in a plate diaphragm, due to the influence of higher frequencies, nodes of vibration always appear within the diaphragm surface resulting with such a diaphragm and the systems operatively connected thereto in very complicated frequency curves which can hardly be predetermined theoretically, for a diaphragm of the piston type resonance conditions may be obtained which are very accurately defined and the reactions of which upon the operatively connected electric and acoustic elements can be predetermined and calculated in every detail.

In order to make electro-acoustic devices having a piston type diaphragm sufficiently resistant against mechanical influences such as shocks especially in order to render them easily transportable, it is not only necessary to make the piston diaphragm as light as possible but also the stiffness of its suspending means must not be too small. Prior to the invention, it has therefore been impossible to place the mechanical natural vibration of a piston type diaphragm at the lower limit of the acoustic frequencies without incurring a very high sensitivity to shocks. On the other hand, it would be useless to place the resonance frequency on the upper limit of the acoustic frequency range inasmuch as the system would then be too stiff and its efficiency too low. Every resonance frequency within the acoustic range leads, however, to distortion.

It has already been suggested to provide electro-acoustic devices of the type mentioned above at a point behind the piston type diaphragm with a closed slotlike air chamber of very shallow depth when seen in the direction of vibration. Such air chamber then forms behind the diaphragm an air cushion the elastic effect of which supports the mechanical stiffness of the diaphragm and therefore increases the natural frequency thereof. It is thus possible without any difficulty to raise the natural frequency of the piston type diaphragm to approximately 2000–6000 Hertz and to raise the frequency curve of the electro-acoustic device within such frequency range accordingly.

In order to compensate the drop of the frequency curve within the range of the low frequencies, it has already been suggested to couple the mentioned shallow air chamber which is directly limited by the piston diaphragm, through a connecting slot with a rather undamped Helmholz resonator the natural frequency of which lies about one octave above the lowest frequency to be reproduced and the resonator neck of which terminating in front closely beside the piston type diaphragm contains a covibrating mass of air the acoustic impedances of which corresponds to the mechanical impedance of the piston diaphragm. The air in the resonator neck then vibrates within the range of the mentioned resonance frequency with opposite phases relative to the rear side of the diaphragm, that is, with equal phases relative to the front side thereof. Although in such a manner a sound transmitter or sound receiver, respectively, will be obtained the efficiency of which is constant within a rather wide range of frequency, such devices can, however, neither be combined with sound guiding means of the common type such as funnels or horns, nor especially can they be used for producing a transformation of velocity, nor can they be coupled with sound transmitters or receivers of a different type for the purpose of obtaining any desired special distribution of sound pressure or sound sensitivity, respectively, without losing their tuning and thus their advantageous effects.

Another method known as such for obtaining a flat topped frequency curve by means of an electro-acoustic device having a piston type diaphragm and an air cushion, consists in coupling the mentioned cushion chamber with a highly

damped resonance chamber the resonance frequency of which corresponds to the natural frequency resulting for the piston diaphragm from its mechanical impedance in cooperation with the stiffness of its suspending means and the elastic effect of the mentioned cushioning volume. Although it is hereby possible to suppress to a large extent the resonance peak caused by the intentionally increased natural vibration of the piston type diaphragm, at the same time a strong damping of the entire system will occur extending over a wide frequency range and affecting the efficiency considerably.

The present invention relates to an improvement of electro-acoustic devices having a piston type diaphragm, which improvement can be applied in accordance with the known proposals mentioned above both to sound transmitters as well as sound receivers, and which makes it possible for the first time to provide piston type diaphragms of low weight which in accordance with the requirements of transportation are equipped with sufficient mechanical stiffness, with a natural frequency which lies at, or even below, the lowest frequency of the acoustic frequency band to be governed. This apparently constitutes the ideal condition of an electro-acoustic device inasmuch as in this manner a constant of the efficiency comprising the entire frequency range of practical acoustics can be obtained without any undesirable damping, that is, without lowering of the entire level of efficiency and without affecting the possibility of coupling to such acoustic system sound guiding means of any desirable type or other auxiliary means for obtaining a certain distribution of sound pressure or sound sensitivity, respectively.

Another object of the present invention is to apply the known phenomena of acoustic transformation of velocity in diaphragm chambers having connected thereto a narrow sound guide in combination with the laws applicable to air columns vibrating in a longitudinal direction, in order to increase the mechanical impedance of the piston diaphragm by the acoustic impedance of an air column covibrating cophasely in longitudinal direction, in such a manner that the natural vibration of the system thus formed is decreased down to the lower limit of the practical acoustic range, that is, to about 50 to 30 Hertz. Since covibrating air columns obviously do not affect the mechanical resistance of a diaphragm toward shocks, the desired object will be obtained in this manner without affecting in any way the security against shocks.

These and other objects, features and advantages of the present invention will be more fully understood from the following detailed description in connection with the accompanying drawings, in which

Fig. 1 is a diagrammatic view of one form of the invention;

Fig. 2 shows diagrammatically an electric transmission circuit constituting an equivalent to the accoustical system shown in Fig. 1;

Fig. 3 shows in cross section another embodiment of the invention;

Fig. 4 is an electric circuit diagram equivalent to the device shown in Fig. 3;

Fig. 5 shows the frequency curve obtained with the device according to Fig. 3;

Fig. 6 shows in cross section another embodiment of the invention;

Fig. 7 is an electric circuit diagram equivalent to the device shown in Fig. 6;

Fig. 8 shows the frequency curve obtained with the device according to Fig. 6;

Fig. 9 shows in cross section still another embodiment of the invention;

Fig. 10 is an electric circuit diagram equivalent to the device shown in Fig. 9.

If, as shown in Fig. 1, a loudspeaker having a piston-shaped diaphragm M is provided with a funnel K the opening O of which is smaller than the surface of the diaphragm M, at the opening O because of the transformation of velocity arising, variations of velocity p_o occur which are considerably higher than the variations p_m occurring at the diaphragm surface. If F is the vibrating surface of the piston type diaphragm M and F_o is the speaker opening O, the relation of these velocities is determined by the equation:

$$p_o:p_m=F^2:F_o^2$$

These known phenomena are used according to the invention in a new manner for obtaining the above mentioned effect.

Thus, if an air chamber C_1 forming an air cushion of the kind known is provided behind the diaphragm M and the open end of a tube R_1M_1 having a cross sectional area f is connected to such air chamber, a transformation of velocity occurs also at this point, and the variations of velocity p arising at the front opening of the tube R_1M_1 when the diaphragm M is vibrating, are determined in an according manner by the equation:

$$p=pm\cdot\frac{F^2}{f^2}$$

in which the ratio:

$$\frac{F^2}{f^2}=T \quad \text{-----------------} \quad (1)$$

may be called the "ratio of transformation."

If merely the system is now considered which is formed by the diaphragm M and the elastic stiffness C of its elastic suspending zone as well as by the air chamber C_1 and the tube M_1R_1, it will be seen that when the diaphragm is vibrating, the mass of air in the tube R_1M_1 is forced to execute longitudinal vibrations and forms an impedance which is operatively connected with the diaphragm M and thus lowers the natural vibration of the diaphragm. Although this mass as such is very small, the velocities to which it is subjected are in the same relation to the velocities to which the piston diaphragm is subjected, as the relation of the square of the surface F is to the square of the surface f. Therefore, by means of the occurring transformation of velocity, this longitudinal covibrating mass of air acts as a mechanical mass which is connected to the diaphragm by means of the longer arm of a two-arm lever, the length of the arms of which being according to the equation (1): $F_2:f_2=T$. Thus, the acoustic impedance M_1 of this air column covibrating in longitudinal direction is determined by the specific weight s of the air, and the length l and the cross sectional area f of the tube R_1M_1 according to the formula:

$$M_1=T.l.f.s=\frac{l.f.s.F^2}{f^2}=\frac{l.s.F^2}{f} \quad \text{------------} \quad (2)$$

The manner in which this impedance M_1 is to be introduced into the acoustical consideration of the system disclosed can best be seen from the theoretically equivalent electrical diagram shown in Fig. 2. The impedance M of the piston diaphragm first forms together with the stiffness C of its suspending means and the stiffness C_1 of the air cushion behind the diaphragm an oscillatory operating circuit which is shown in the

diagram according to Fig. 2 as an oscillatory circuit C, M, C_1, E. The vibrations of the piston type diaphragm produced by electric or acoustic driving energy, respectively, act upon this oscillatory circuit as an impressed alternating potential E. The mentioned oscillatory circuit is operatively connected through a resistance R_1 indicating the frictional resistance of the air within the tube R_1M_1, with the impedance M_1 of the air column longitudinally vibrating within the tube, whereby said impedance is to be considered according to the equation (2). Thus, a second oscillatory operating circuit C, M, R_1, M_1, E is formed.

Tests have shown that the resonance frequency of the oscillatory circuit M, C, R_1, M_1, E of piston type diaphragms the mechanical natural vibration of which lies at about 100 to 200 Hertz and which thus have at least some resistance to knocking and shocks, can be brought down without difficulty to 50–30 Hertz. It is therefore possible to obtain in this manner at the lower region of the acoustic frequency range a resonance resulting in a compensation of the frequency curve as this could previously only be obtained by the above mentioned means which all disclosed basic disadvantages of various kind.

Obviously, for this purpose it assumed that the capacity C_1 according to Fig. 2, that is, the air cushion C_1 behind the diaphragm M according to Fig. 1, will be made sufficiently small so as not to act as a capacity short circuit which would decouple the impedance M_1 from the oscillatory system C, M, C_1, E. The easiest way of obtaining this is by making C_1 so shallow that the natural frequency of the oscillatory circuit M, C, C_1, E is placed at the upper region of the frequency range to be governed, that is, for example, within the region of 8000 to 10000 Hertz.

If, according to Fig. 1, the velocity transforming chamber in front of the diaphragm M and the funnel K are removed, the resulting arrangement, similar to every rearwardly open system, forms a pressure gradient receiver or transmitter, respectively, which acts similar to a band microphone or band loudspeaker, but can be equipped with a normal magnetic, dynamic or capacitative driving system so that it does not require any special adapter transformer in order to combine this system with an acoustic pressure receiver or transmitter of the usual kind or of the kind according to the invention, for obtaining receiving or transmitting characteristics of any special type. If, on the other hand, the side of the tube R_1M_1 directed away from the diaphragm terminates into a chamber which is closed to the outside, for example, by the housing of the entire system, the inner space of such housing acts as a capacity C_2 lying in series with the impedance M_1, as indicated in dotted lines in Fig. 2.

Concerning the tube R_1M_1, the above equation (2) shows that only the cross sectional area and the volume enclosed thereby are of importance. Therefore, this tube may also be given the shape of, for example, an annular slot which may at the same time be utilized for accommodating the vibrating coil of the dynamic driving system. However, it has been found to be of greater advantage to utilize said annular slot for coupling a further stiffness element to the system and hereby to form still another suitably tuned oscillatory operative circuit. It has been found that in such a manner further surprising advantages may be obtained, as will be described hereafter.

A close study of the diagram according to Fig. 2 shows that aside from the two oscillatory circuits C, M, C_1, E and C, M, C_1, R_1, M_1, E which directly include the source of alternating current E and which may therefore be called "operative circuits", it also contains the resonance circuit C_1, R_1, M_1 which is coupled to the source of alternating current E through the alternating current resistance M, C and therefore acts as an energy dissipating circuit as it destroys the energy which it withdraws from the driving system. As long as the impedance M_1 is not more than ten times as high as the impedance M, the resonance frequency of this coupled energy dissipating circuit can be held above the frequency range to be reproduced, that is, for example, at 10.000 Hertz. However, since the known oscillation formula of the natural frequency varies only in proportion to the square root of the impedance, this means that the mechanical natural vibration of the diaphragm M can be brought down by the impedance M_1 only to about a third of its mechanical value, so that the mechanical natural frequency of the diaphragm M may only be placed at about 150 Hertz if in the higher ranges of the frequency band to be transmitted undesirable saddles in the frequency curve caused by said energy dissipating circuit should be avoided.

If a further stiffness element is coupled to the system by means of the annular slot provided for accommodating the vibrating coil, such saddles may be avoided by coupling a further operative resonance circuit to the cushion chamber. The impedance M_1 can then safely be given the value which mechanically is the most suitable. Since piston type diaphragms with an attached vibrating coil are made with the least difficulty and with the most favorable combination of shock resistance and electro-mechanical efficiency for a mechanical natural vibration of about 400 to 500 Hertz, this value of M_1 is about a hundred to four hundred that of M, that is, a value which according to the invention results in lowering the acoustically active natural vibration ten to twenty times relative to the original mechanical natural vibration.

An embodiment of a pressure receiver constructed in such a manner according to the invention is shown in Fig. 3. The diaphragm M having the usual dome shape, carries at its edge the vibration coil S within the ring shaped elastic suspension zone C. The vibrating coil S enters into an annular slot R_3 behind which a volume of air C_3 is provided in a known manner. The cushion chamber C_1 provided as usual behind the diaphragm and limited by the pole piece B of suitable shape communicates according to the invention with a small tube R_1M_1 the enclosed volume and the opening of which facing the diaphragm are thus tuned to the mechanical impedance of the diaphragm that, in view of the transformation of velocity arising, the impedance M_1 of the air column covibrating in longitudinal direction within the tube R_1M_1 reacts upon the natural frequency of the piston type diaphragm with a multiple T of the mechanical impedance M of said diaphragm. For this purpose, the relation of the acoustically active impedance M_1 to the impedance M is made so extremely large that the natural frequency of the oscillatory system which is formed by the cushioning volume C_1 and the covibrating volume R_1M_1, enters into the range of the frequency band to be governed. However, at the same time, the natural frequency of the oscillatory system which is formed by the impedance M of the diaphragm, the stiffness C

of the diaphragm suspension, the stiffness of the air space C_3 behind the annular slot R_2 and the impedance M_2, is tuned approximately to this same frequency, the impedance M_2 which may sometimes be negligible being calculated for the volume of air covibrating in longitudinal direction in the annular slot R_2 in consideration of the transformation of velocity arising.

The importance of these operations will easily be seen from Fig. 4 showing the theoretically equivalent electrical diagram for the system according to Fig. 3. This diagram generally shows three operative circuits directly supplied by the source of alternating current E, and two energy dissipating circuits coupled thereto, namely:

(I) The operative circuit M, C, C_1, E the natural frequency of which should lie at the upper region of the frequency band to be governed;

(II) the operative circuit M, C, R_1M_1, C_2, E the natural frequency of which should lie at the lower region of the range of frequency to be governed;

(III) the energy dissipating circuit R_1, M_1, C_2, C_1, the natural frequency of which should lie either above the upper region of the range of frequency to be governed or which may be placed at any region of the range of the frequency to be governed if it is made substantially equal to the natural frequency of—

(IV) the operative circuit C, M, R_2, M_2, C_3, E which, with suitable damping (R_2), then overcomes the detrimental effects of the energy dissipating circuit mentioned under III;

(V) the energy dissipating circuit R_1M_1, C_2, C_3, M_2, R_2, the resonance frequency of which necessarily lies closely to the resonance frequency of the oscillatory circuit II as it contains the same elements, which, however, does not come into acoustic appearance since it contains the resistances R_1 and R_2 in series and therefore being extremely damped.

That these conditions can actually be applied in practice may be seen by the following example:

Experiments have proven that a piston type diaphragm having an effective surface area of 7 cm^2 and a weight M, including that of the vibrating coil, of 0.1 gram can be built without any difficulty. The stiffness of the diaphragm suspension has been measured to be $4.4.10^5$ Dyn/cm whereas for the annular slot R_2 provided behind the vibrating coil a frictional resistance was determined amounting with regard to the diaphragm M to about 2000 ohms.

With such a diaphragm the mechanical natural vibration of which lies at about 400 Hertz, the best results have been found to be if a cushion C_1 having a volume of 0.35 cm^3 is used in combination with a small tube R_1M_1 having a length of 1.3 cm and a cross sectional area of 0.01 cm^2, a housing C_2 having a volume of 250 cm^3 and a resonance C_3 having a volume of 30.6 cm^3 which is coupled to the cushioning volume through the annular slot R.

The above values and the formulae mentioned in the beginning then lead to the following values:

M=0.1 gram C=$4.4.10^5$ Dyn/cm
M_1=9.8 gram C_1=$2.3.10^8$ Dyn/cm R_1=1200 ohms
C_2=$2.8.10^5$ Dyn/cm
C_3=$2.3.10^6$ Dyn/cm R_2=2000 ohms

On the basis of the well known oscillation formula:

$$V=\frac{1}{2}\cdot\sqrt{\frac{c}{m}} \qquad (3)$$

into which for calculating each circuit the sum of the stiffness elements $(C+C_1+\ldots)$ and the sum of the impedance elements $(M+M_1+\ldots)$ contained in this circuit are to be inserted, the following values will be found for the individual oscillatory systems mentioned above:

I. V_1=8000 Hertz
II. V_2= 45 Hertz
III. V_3= 800 Hertz
IV. V_4= 800 Hertz

The influence of the resistances R_1 and R_2 upon the resonance frequency is negligible. However, it is important that the resistance R_2 be made relatively large in order to damp the operative circuit IV in a suitable manner. Since an acoustic frictional resistance is proportional to the circumference divided by the surface area of a given channel cross section and slotlike channels therefore result in especially high frictional resistances, the annular slot R_2 fulfills this requirement in a very suitable manner. If the annular slot R_2 should not be used for coupling the resonance volume C_3 to the cushioning volume, a larger number of narrow channels arranged parallel to one another like a sieve will best be suitable for this purpose.

The measured frequency curve of the microphone the values of which have just been discussed in detail, is shown in Fig. 5 in a full line, whereas the frequency curve arising when the front opening of the tube M_1R_1 is closed, is indicated in this figure in dotted lines. It will be seen that the most important difference between these curves lies in the fact that according to the invention, the drop of the efficiency below approximately 600 Hertz will be avoided and that in this manner a practically straight frequency curve may be obtained extending from 30 Hertz to approximately 10.000 Hertz.

In devices the range of frequency of which only needs to extend to about 8.000 Hertz, the very small impedance M_2 cooperating with the annular slot R_2 may usually be neglected. If, however, a range of frequency up to more than 10.000 Hertz should be safely covered, a circuit which so far has not been considered, will be found to have a disturbing influence, namely:

VI. the energy dissipating circuit C_1, R_2, M_2, C_3 the natural frequency of which is relatively high because of the very small impedance M_2 usually lying at about 12.000 Hertz. In order to compensate the effect of this circuit, it is possible to provide in an analogous manner to the provision of the resonance circuit IV for compensating the energy dissipating circuit III, a further resonance circuit R_3, M_3, C_4, as shown in Figs. 6 and 7, which consists of an air chamber C_4 and a channel R_3M_3 connecting said air chamber with the cushioning chamber C_1, the chamber C_2 then being suitably provided at the inside of the pole piece B, as shown in Fig. 6. A frequency curve obtained with this system is shown in Fig. 8.

Obviously, the same principle may be further applied several times in order to avoid even the least irregularities in the frequency curve shown in Fig. 8. However, difficulties will then easily arise regarding the space for providing the various channels and air chambers, inasmuch as the length of the channels may not exceed one half of the wave length of the highest frequency of the frequency band to be covered in order that stationary waves will not form at the inside of such channels.

These difficulties as to the necessary space may, however, be avoided according to the invention

as shown in Fig. 9, by providing these channels, the length of which is in the danger of exceeding one half of the shortest wave length of the frequency band to be covered, at suitable distances from one another with lateral apertures terminating in separate air chambers *Ca*—*Cd*. A channel thus composed of the sections M*a*—M*e* then forms an acoustic filter as indicated in Fig. 10, in which the sections M*a*—M*e* lying between the individual apertures act like self-inductances connected in series between which capacities *Ca*—*Cd* are connected. Obviously, such construction fully avoids the formation of stationary waves. It is, however, only necessary to apply this feature merely to channels the length of which exceeds the amount of about 1.3–1.5 cm, inasmuch as, for example, a channel length of 1.3 cm is already sufficiently short to cover an acoustic frequency band extending up to 12.000 Hertz.

RUDOLF GÖRIKE.

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BY A. P. C.

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ELECTRO-ACOUSTIC DEVICES

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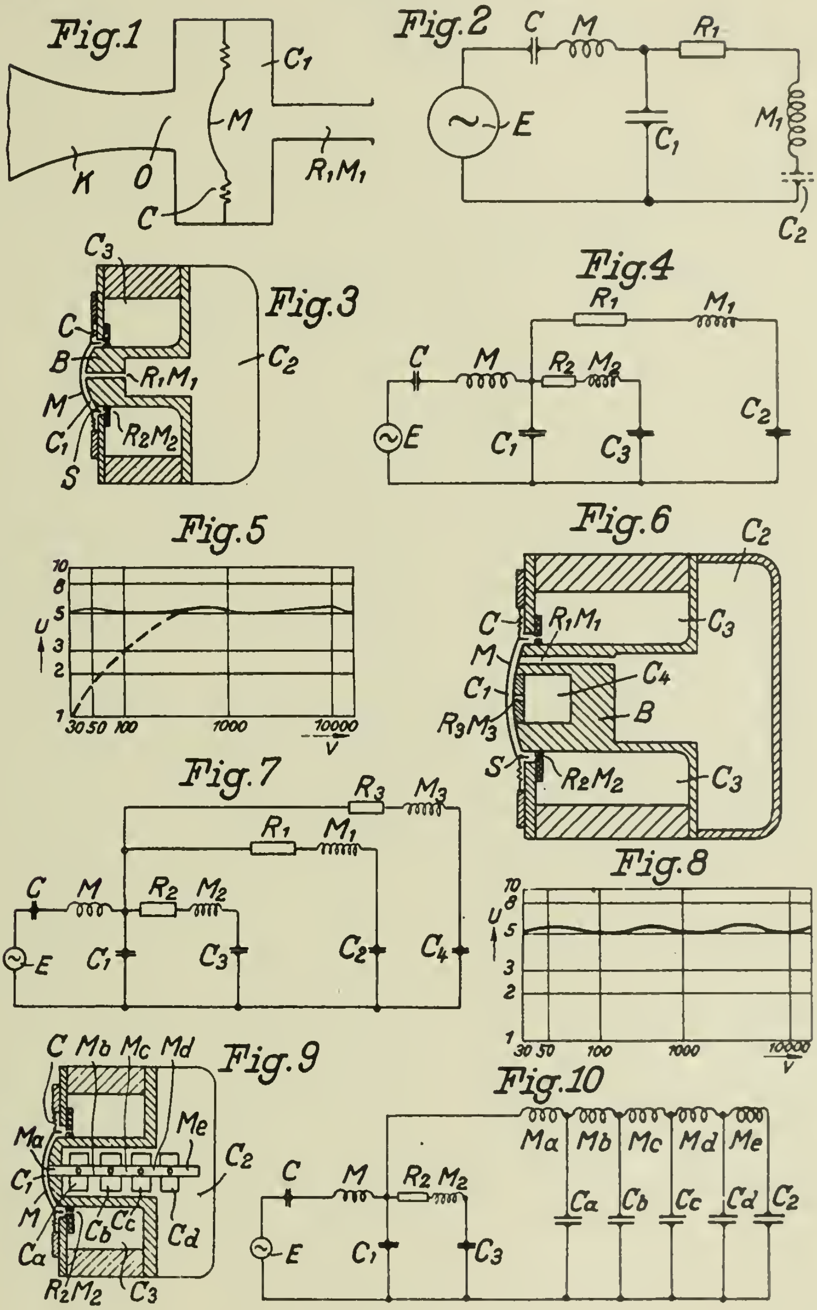

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ALIEN PROPERTY CUSTODIAN

ELECTROMAGNETIC DEVICES FOR RESEARCHING SUNKEN SHIPS, IRON CONTAINING SANDS AND OTHER METAL CONTAINING BODIES ON THE SEA GROUND

Arnaldo Zabelli, Rome, Italy; vested in the Alien Property Custodian

Application filed September 12, 1941

My invention relates to an electromagnetic device for researching sunken ships, iron containing sands or other metal containing bodies on the sea ground. This device essentially consists in a waterproof and heavy carter containing an electromagnet, and in an oscillatory circuit exciting the said electromagnet. By means of this device the research is effected by measuring the impedance variations of the oscillatory circuit which are produced by the variations in the magnetic field of the electromagnet, due to the presence of metal containing especially of iron containing bodies. In order to compensate disturbing influences during the measuring, a Wheatstone bridge with additional variable resistances is inserted according to my invention in the exciting circuit of the electromagnet.

A form of execution of the object of the invention is schematically shown by way of example on the accompanying drawing.

The research device (9—12) let down on the sea ground from a ship or a boat consists of a carter **9** suitably weighty to be quickly sunk on the sea ground, preferably of lead. The open lower side of this carter is closed by a Celluloid or like plate **12** in order to avoid the disturbance which would be produced on the pole pieces of the magnet **10** by a metal mass facing them. The Celluloid plate **12** is tightly pressed on the edges of the carter **9** by means of screws with interposition of gum rings, so that water cannot penetrate and damage the electromagnet. **11** is the exciting bobbin connected with the electric circuit fed by a usual generator (**1**—**4**) producing an oscillatory current of audible frequence. On the drawing, **1** is a battery of 12 volts, **2** is a positive booster placed in a screwing case **3**, and **4** is the audible frequence-oscillator.

By moving the research device (9—12) on the sea ground, its reactance due to self-induction is caused to vary whenever it comes into contact with iron containing sand or iron containing bodies, and therefore also the impedance of the feeding circuit is caused to vary. These variations may be read on a galvanometer **8** provided with an amplifier **7** and a selective filter **6**.

The galvanometer **8** is connected to the circuit over a Wheatstone bridge **5** comprising four slidable contacts which may be moved on the four resistances r_1—r_4. The two resistances r_1 and r_2 of this bridge which are in series connection are for the coarse regulation and the two derivated resistances r_3 and r_4 are for the fine regulation.

The Wheatstone measuring bridge is provided in order to allow before each measurement such a displacement of the galvanometer contacts on the derivated resistances that the galvanometer is in the zero position. This regulation is effected with the device drawn up over the point of measurement, for the purpose of eliminating the reactance variations due to magnetic disturbances which are frequent on the sea ground.

ARNALDO ZABELLI.

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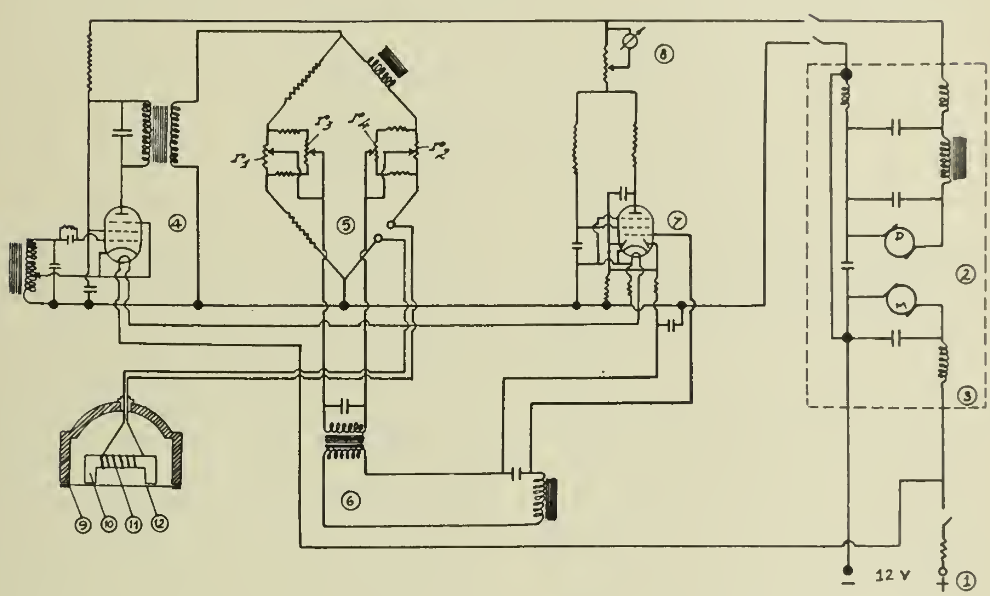

Arnaldo Zabelli

Published May 18, 1943

Serial No. 411,428

ALIEN PROPERTY CUSTODIAN

INK RIBBON FOR TYPING-,CALCULATING MACHINES AND THE LIKE

Alfred Fröhlich, Vienna-Modling, Germany; vested in the Alien Property Custodian

No Drawing. Application filed September 18, 1941

At the production of ink ribbons for typing-, calculating- or similar machines, it is desirable to apply onto the ribbon lasting printings in a simple manner. These printings may serve for various purposes. For instance, it is possible to equip the ribbon with a permanently visible designation of the place of origin or with a reference to the proprietor of the ribbon by printed matter uniformly distributed over the whole length of the ribbon; on ink ribbons with spare zone, the typing zone can be differentiated from the spare zone by printed matter in order to prevent in this manner an incorrect inserting of the ribbon into the machine. The same is valid for ribbons typing on one side, in order to indicate the typing side when both sides of the ribbon look alike.

The printing of the ink ribbons encounters difficulties chiefly for the reason that the inks used herefore are dissolved and colored by the liquid constituents of the inks with which the ribbons are impregnated. These printings consequently very soon fade, so that they can be read only with difficulty or even not at all, for the reason that the ink applied by the printing penetrates into the pores of the fabric, this being further assisted by the types striking against the ribbon.

It has been ascertained that these inconveniences do not occur, if the printing ink, by means of which the printed matter is produced, contains as coloring body a metal powder, such as ground aluminum, brass- or bronze-powder or any other metal powder. In this manner a very well lasting permanent printing is obtained, probably owing to the fact that the metal grain is less moistened by the liquid of the ink of the ribbon than this is valid for the coloring substances of the printing inks otherwise in question.

ALFRED FRÖHLICH.

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ALIEN PROPERTY CUSTODIAN

METHODS FOR PURIFYING MANGANESE IN METAL STATE

Pietro Guareschi, Genoa, Italy; vested in the Alien Property Custodian

No Drawing. Application filed September 18, 1941

As known, manganese ores are hardly found in pure state in nature and manganese in pure state and particularly free from iron is not easily obtained directly from manganese ores.

This invention is directed to a method for purifying manganese in metal state and by means of the method of this invention iron and other impurities may be removed therefrom; in the method of this invention manganese in metal state and iron and other impurities contained in manganese in metal state are converted into soluble salts by an attack by means of acid and subsequently iron and other impurities are precipitated by the addition of an oxidising agent followed by a neutralisation step; thereafter the precipitate containing the whole of iron and impurities present in the initial metal is separated by physical means and the solution of manganese salt is treated, preferably by electrolysis, to obtain pure manganese in metal state.

The electrolysis step is effected with advantage in a manner proper to obtain and hold the anolyte and catholyte separate from each other for their re-use in the process.

Manganese dioxide is preferably used as oxidising agent for precipitating iron, and for such a purpose manganese dioxide obtained in said electrolysis step is used with advantage because it is in pure state and does not introduce foreign substances in the solution.

An embodiment of the method of this invention is hereinafter described by way of example.

Manganese in metal state which is impure mostly because of a content of iron therein, is treated with sulphuric acid or sodium bisulphate; thus a solution is obtained which consists of manganese sulphate and ferrous sulphate.

An oxidising agent is added to said solution, preferably manganese dioxide (MnO_2) and thus iron present in the solution is converted into ferric state ($Fe_2(SO_4)_3$) manganese being converted to the state of manganous salt ($MnSO_4$).

Subsequently the solution is neutralised by an addition of a neutralizing agent as calcium carbonate or ammonia in gas or solution state, in presence of ammonium salts; iron is thus precipitated in the state of ferric hydrate. The neutralisation step may be effected with advantage by using as neutralising agent the catholyte obtained from the subsequent electrolysis step.

Then the precipitate is separated, this operation being effected physically by means of a decanter and a vacuum filter; thus a solution of $MnSO_4$ free of impurities is obtained which is subsequently treated for deposition of manganese in metal state by an electrolysis step in presence of ammonium salts.

Manganese in the state of pure metal is thus obtained while the anolyte, catholyte and manganese dioxide are carried in the process again; the anolyte recovered from electrolysis step may be used for the initial acid attack of the metal manganese and the catholyte may be used in the neutralizing step while the manganese dioxide is availed of in the oxidising step effected before the neutralisation one.

By way of example to recover one kiligramme of manganese in metal state from a certain weight of manganese in metal state with an impurity content due to the presence of iron, silicium and other impurities therein, said metal manganese is comminuted and subsequently it is leached with diluted sulphuric acid (having a content of about 20% of sulphuric acid) to obtain manganese sulphate; to the solution of manganese sulphate an excess of manganese dioxide and then about 5 kiligrammes of ammonium sulphate and ammonia are added up to secure the neutralisation of the acid liquor; iron and other impurities are thus precipitated, including silicium which is partly oxidised and partly removed in the state of silicic anhydride during the attack step.

The precipitate is separated and the pure solution thus obtained is electrolysed with cathodes made of aluminium or of stainless steel and with lead anodes, use being made of partitions of porous porcelain or bags of glass filaments and fabric and asbestos sheets to recover the anolyte and catholyte separately; thereafter the manganese cathodes thus obtained are removed from the cathodes of the electrolysis cell pure manganese dioxide being obtained on the lead anodes for reuse in the process.

The attack of metal manganese may if desired be effected by means of other mineral acids as hydrochloric acid; the corresponding salts of manganese and iron are thus obtained and iron is subsequently precipitated by an oxidation step and thereafter the process is prosecuted in the above described manner.

PIETRO GUARESCHI.

Published May 18, 1943

Serial No. 411,430

ALIEN PROPERTY CUSTODIAN

METHODS FOR PRODUCING MANGANESE IN METAL STATE AND PURE MANGANESE DIOXIDE IF DESIRED, FROM MANGANESE ORES

Pietro Guareschi, Genoa, Italy; vested in the Alien Property Custodian

No Drawing. Application filed September 18, 1941

This invention has for its object a method for producing manganese in metal state and if desired pure manganese dioxide, from manganese ores.

In the method of this invention the manganese ore is converted into manganese sulphate by an attack by means of sulphuric acid or, at least in part, by the anolyte recovered from a final electrolysis step in the process, and by operating in presence of a reducing agent which converts the manganese dioxide, being by itself slightly responsive to attack by diluted acids, into manganese monoxide which on the contrary is easily attacked. A mixed solution of manganese sulphate and of sulphate of the element used as reducing agent is thus obtained; said solution is subsequently neutralised for the precipitation of the reducing agent from the solution and the precipitate is subsequently carried again into the process.

Finally the solution of manganese sulphate is electrolysed and thus manganese in metal state and, if desired, pure manganese dioxide is obtained; the electrolysis is carried out with advantage in such a manner as to obtain and keep the anolyte and catholyte separate for their reuse in the process.

As reducing agent a solution of a soluble iron salt in ferrous state is used with advantage in that the most of impurities present in the ore and consisting usually mainly of iron, arsenic, antimony, etc. precipitate with said salt at the time of the neutralisation step.

An embodiment of the method of this invention is hereinafter described by way of example assuming that pyrolusite is treated and that iron is used as reducing agent.

Pyrolusite is attacked by means of sulphuric acid in the presence of ferrous sulphate which acts as a reducing agent; the manganese oxides are thus reduced into manganese monoxide and are attacked by sulphuric acid thus producing a solution of $MnSO_4$ and $Fe_2(SO_4)_3$.

Say for the purpose of treating 100 Kg. of pyrolusite having a 50% content of MnO_2, 70 Kg. of iron are used said iron being recovered in the process, and 600 Kg. of diluted (20%) sulphuric acid, this acid also being recovered.

The removal of impurities of the class of copper, zinc, cadmium, etc. from the solution is effected by precipitating said metals by pure electrolytic manganese in powder state, said manganese being taken from the manganese obtained by electrolysis in the final step of the process.

Subsequently iron is precipitated by neutralising the solution; said neutralisation may be effected as usually by means of calcium carbonate or ammonia in gas state or in solution state in presence of ammonium salts, or preferably, in accordance with this invention, by taking advantage of the catholyte recovered from the subsequent electrolysis step and consisting of an alkaline solution of ammonium salts with manganese sulphate; for such a purpose the electrolysis step is carried out with the aid of porous separating partitions in conditions proper to obtain the anolyte and catholyte separately.

The neutralisation step may be improved by having the residual ferrous salts, if any, converted into ferric state by a previous addition of manganese dioxide obtained in the electrolysis step.

The ferric hydrate which precipitates as an effect of the neutralisation may be regenerated into ferrous sulphate which is subsequently carried again in the process in the ore attack step; for this purpose the ferric hydrate is dissolved into sulphuric acid in the presence of sulphur dioxide or of an alkali sulphide or, in accordance with a feature of this invention, in the anolyte recovered from the electrolysis step and consisting of an acid solution of manganese sulphate and of ammonium sulphate.

The solution thus obtained, consisting of pure manganese sulphate, is treated by an electrolysis step in which manganese in metal state is obtained at the cathode, a portion of said manganese being used if desired for the purification of the solution as above stated; by a proper control of the electrolysis step it is also possible to obtain pure manganese dioxide on the anode, which may be used in oxidising steps preceding the neutralisation step.

The electrolysis is effected with advantage by means of cells having porous partitions to secure the separation of the anolyte and catholyte from each other; in these circumstances the acid anolyte is obtained separately for further use either in the attack of the ore or for regenerating the ferric hydrate which has been precipitated as an effect of the neutralisation step, said ferric hydrate being regenerated into ferrous sulphate by treatment with said anolyte in presence of a reducing agent; on the other hand the recovered catholyte may be used again in the process for neutralizing the acid solution of manganese sulphate, ferric sulphate and ammonium sulphate.

PIETRO GUARESCHI.

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ALIEN PROPERTY CUSTODIAN

SYSTEM FOR JOINING PARTS OF METALLIC STRUCTURES TO EACH OTHER

Gerolamo Merlini and Clemente Giorza, Milano, Italy; vested in the Alien Property Custodian

Application filed September 19, 1941

It is known the fact that the rivets in the rivetings used in industrial constructions for joining metallic parts, undergo not only shear stress but tensile stress too, and this is because they are applied with heat, and when they cool they have a tendency to become shorter. Heat is employed for this purpose so that the shanks of the rivets will ram in the holes to have the parts engaged well between each other. It is furthermore known that while shear stress can be calculated, tensile stress cannot be calculated exactly as it depends on the temperature, which is essentially variable and doubtful, at which the rivets are applied. Within certain limits this tension contributes sometimes to keep the parts together, but it generally does harm to the strength of the rivets and hence to that of joining: it not unrarely happens that the heads of the rivets come off by themselves, during operations of caulking for tightness. On the other hand the diameter of the rivets becomes less on cooling and therefore they no longer fill the holes exactly in which they are inserted. The longer the rivets are and the larger their diameter is, the easier it is to meet with such troubles which are particularly serious when steam boilers are dealt with, or generally pressure containers where perfect tightness of the parts between each other is required besides mechanical joining.

The subject-matter of this invention is a system of joining the parts of metallic structures to each other and it entirely does away with the troubles mentioned above.

According to the invention the system substantially consists in using threaded stud bolts instead of heat applied rivets, which are hollow at one of their ends at least and they are screwed without heat in the holes made through the parts to be joined and threaded according to the corresponding female screw, after which they are broached and pressed or caulked in their hollow end or ends until complete adherence takes place between their threading and the female screw threading of the corresponding holes in the parts to be joined.

The hollow at one or both the ends of the stud bolt does reach the part of it corresponding with the line where the parts to be joined touch, and this is because the whole section of the stud bolt intervenes there to hold out against the shear.

While the full part of the stud bolt has the task of holding out against shear stress in this way as mentioned hereinbefore, its threading has the function of the heads of rivets, with the advantage that as application now takes place without heat, there is no shrinkage whatsoever either in the section or in the length, and hence no supplementary stresses occur of unknown ranges. The advantage is furthermore obtained of perfect tightness ensured with the close and absolute adherence, which, with the aforesaid broaching, pressing or caulking is obtained between the threads of the screw and those of the female screw.

The length of the stud bolts will at least equal to the total of the thicknesses of the parts to be joined; but greater length can be suggested however for the hold required for the operation of threading and forcing of the stud bolts in the tapped holes. In view of the foregoing it will likewise be advisable to use the same material as that of the parts to be joined for the stud bolts for the purpose of having the same strength in all points.

It is generally enough and easier to broach the outside end of a stud bolt, but when this operation is not considered to be sufficient, it must be repeated at both ends. As mentioned hereinbefore, radial pressure by hand caulking or with pneumatic hammers can take the place of the broaching, so as to obtain in all cases perfect adherence of at least some threads of the male threading with the corresponding threads of the female threading.

The parts to be joined, i. e., sheet metal, sections or forged pieces, must of course have very smooth touching surfaces and this should always be the case in joinings.

Two examples of practical performance of the invention are illustrated in the drawing annexed hereunto to make it clearly and thoroughly understood: Fig. 1 shows the first example sectioned according to the axis of a stud bolt and Fig. 2 represents likewise the second example.

Both the examples refer particularly to the most interesting case of joining between a forged bottom A and a cylindrical body B for a steam boiler or a pressure container, obtained by forging, wiredrawing or welding. As usual the surfaces *a*—*a* that have to touch are turned so as to be slightly tapering, and the bottoms are applied with heat. Likewise as usual the bottoms and the cylindrical body are perforated at the same time on one row or more: on one row only in the cases illustrated.

According to the invention each hole is tapped either with a male tapper or preferably with a slightly tapering male tapper, after which a part C, C′ is screwed without heat in each hole, this part being threaded in correspondence with the

tapper used for the holes and preferably made of the same material as that of the parts A, B to be joined. In the cases illustrated the said part C, C′ is exactly as long as the total of the thicknesses of the parts to be joined, but it can even be longer as mentioned before. Furthermore, the aforesaid part C, respectively C′, has at one end or respectively at both, a hollow *b*, respectively *b*′, *b*″, and therefore after being screwed up as mentioned hereinbefore, its hollow end or ends are broached with means like those used for broaching pipes, or pressed, or caulked, so that the threads of the said end or ends enter into close contact and engage with the corresponding threads of the holes in parts A, B. Joining is finished after the foregoing.

When carried out with due care, the strength of a joining thus obtained for pressure and tightness can be compared with that of cylindrical bodies having forged ogival bottoms. A large saving in constructions is furthermore obtained by making use of the system according to this invention, with the possibility of obtaining from an ingot a body of larger capacity and resisting to higher pressure than those obtainable with ogive shaping formation of the bottoms.

It is obvious and it must be thoroughly understood that the examples illustrated and described do not confine the invention in any way, and that therefore any other manner of performance of the inventive concept laid out hereinbefore comes within the range and under the protection of this patent.

GEROLAMO MERLINI.
CLEMENTE GIORZA.

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G. MERLINI ET AL

SYSTEM FOR JOINING PARTS OF METALLIC STRUCTURES TO EACH OTHER

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FIG. 1

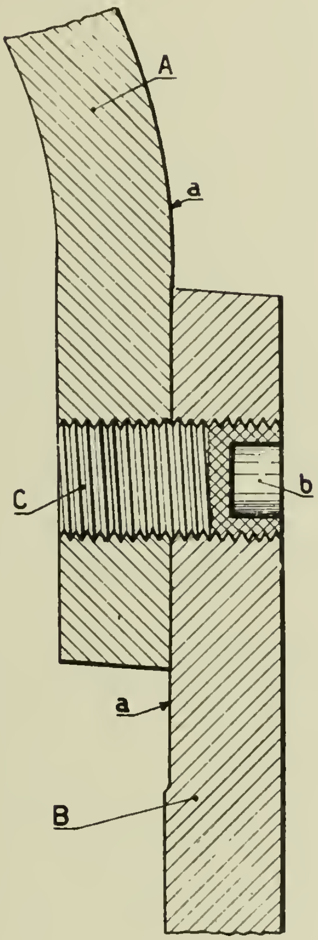
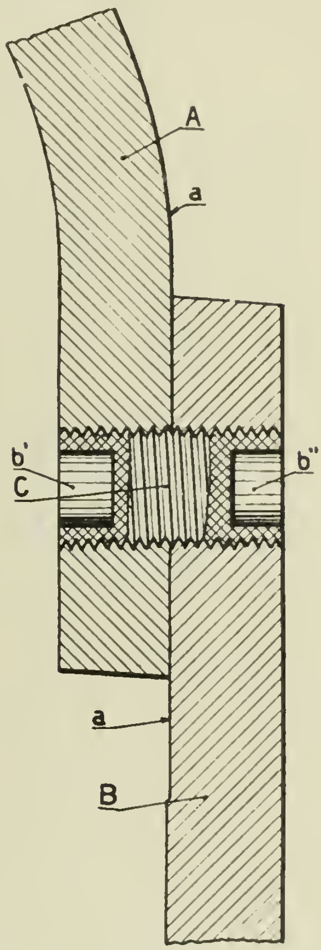


FIG. 2



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ALIEN PROPERTY CUSTODIAN

MICROPHONE

Otto Soldan, Falkensee, Osthaveland, Germany; vested in the Alien Property Custodian

Application filed September 29, 1941

This invention relates to a microphone having a pressure compensation chamber which eliminates the changes in tension caused in the interior of the case by the influence of the ambient temperature. To this end, the operating diaphragm and the carbon chamber of such microphones are arranged in a closed chamber of the case, the chamber being defined by a sealing diaphragm from the operating side and by a flexible water-tight protective wall from the opposite side.

It has been found that this chamber must be tested for air-tightness, which entails connecting a testing device to the chamber. This is accomplished according to the invention by providing the chamber of the case enclosed by the sealing diaphragm and the water-tight protective wall with an opening so as to enable a testing of the chamber for the air-tightness, said opening being accessible from outside and capable of being closed.

Since the arrangement of this opening in the protective wall of the chamber itself is disadvantageous, as its flexibility would thereby be impaired, and since such an arrangement also involves a particular opening in the case, the opening capable of being closed is arranged according to the invention in the contact member mounted at the rear side of the case, which member projects into a space arranged behind the fixed electrode and closed by the protective wall, said space being in communication with the pressure compensation chamber, the portion of the cup-shaped member for the fixed electrode extending in this path of communication being provided for this purpose with one or more openings.

In the accompanying drawing is shown an embodiment of the invention in diagrammatic form in which the single figure shows a sectional view of one half of the sealed microphone case according to the invention. In the microphone case 4 is arranged the carbon chamber 1 which is defined by the fixed electrode 2 and the felt ring 14. The chamber is closed by the operating diaphragm 3 provided with the movable electrode 2′. To seal these parts, a diaphragm 6 is employed consisting of a water-tight foil and arranged at the operating side. In this case the diaphragm 6 rests directly on the operating diaphragm 3 and is preferably glued to the flexible water-tight protective wall 7 forming the lower wall of the chamber 19 as well as to the inner wall of the edge 15 of the case 4, bent at right angles in order to attain a completely air-tight seal of this portion of the case chamber. Since the protective wall 7 with its portion 11 extends at the rear side of the case 4 up to the opening for the contact nipple 13, the hollow space 16 behind the fixed electrode 2 is also protected against moisture by the intermediate wall 11. The cup-shaped member 17 of the fixed electrode 2 is not in direct engagement with the latter, but only with the felt ring 14 so that a path of communication 18 from the space 16 behind the electrode 2 to the pressure compensation chamber 19 proper is thereby provided, which path enables through the openings 20 arranged in the electrode cup-shaped member 17 a free access of air from the one space to the other. The hollow space 16 is closed in the central portion of the rear wall of the case by the contact nipple 13. This contact member is provided with a bore 21 which is closed by a screw 22 and enables after the loosening of the screw the fastening of a control gauge, for instance, of a manometer or the like for testing the pressure compensation chamber for air-tightness.

In this manner, it is possible to test such pressure compensation chambers for air-tightness without impairing the construction of such a microscope.

OTTO SOLDAN.

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O. SOLDAN

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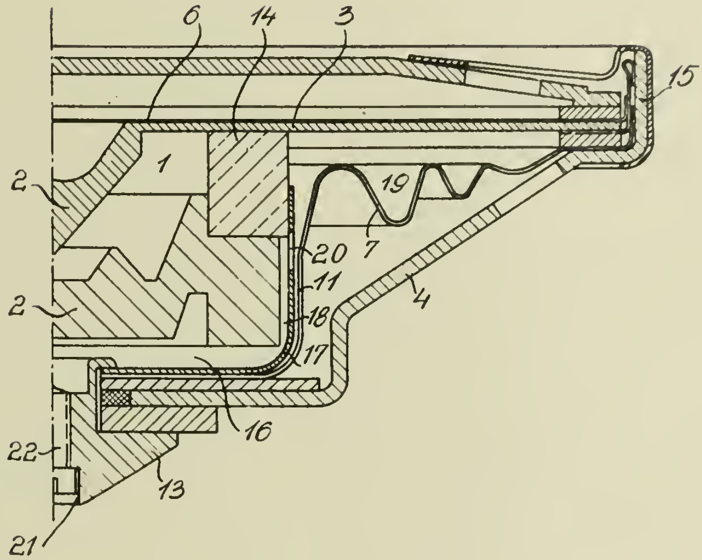

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Attorney

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ALIEN PROPERTY CUSTODIAN

COMPRESSION RESISTANT CHAINS

Karl Bender, Wurzburg, Germany; vested in the Alien Property Custodian

Application filed September 29, 1941

The present invention relates to a compression resistant group of flat link chains for lifting gears of sluices, flood- or lifting-gates, mitred lock gates and the like purposes, comprising two oppositely acting flat link chains capable of being rolled up in the same plane.

For this purpose racks have been proposed, which consist of members pivoted to each other and which when transmitting pressure, are rendered resistant against buckling by guides provided at at least two points. This construction, however, has the drawback that such guides always are required and that a compression resistant structure is only present as far as this guide extends. For this reason the application of these known racks is strongly limited.

Moreover, it has been proposed to produce by means of interlocking steel bands extensible masts having a certain resistance against buckling which, however, are not adapted to exerting considerable pressures.

Furthermore, a proposal has become known to so render four chains stiffened with regard to each other that each chain is connected by means of a toothing to the two adjacent chains, arranged at right angles. This structure also is not adapted to satisfactorily solve the problem and this already due to the complicated construction and lack of reliability of service.

It has also been suggested to produce a compression resistant lifting device adapted to be wound up from two oppositely acting link chains the links of which consist of solid blocks bearing against each other over their entire length, but even this construction cannot be considered to be an ideal solution as the distance the pivot points in this structure are spaced from each other has, of necessity, to be rather small, so that the resultant profile has only a comparatively small moment of resistance against buckling.

According to the invention a more favorable compression resistant structure of the type set forth is obtained by providing a compression resistant group of flat link chains in which a third flat link chain arranged at right angles bears against the two oppositely acting chains and together with the latter forms a compression resistant profile.

To this end the arrangement may be such, that the links of the two oppositely acting chains support each other by eccentrically arranging their chain pins whilst the third chain bears against the chain pins of the two oppositely acting flat link chains.

The two oppositely acting chains may be interlocked by hook-shaped members arranged in spaced relation from each other.

The chains may also be so constructed that the individual links of the two oppositely acting chains may be hook-shaped and locked with the oppositely arranged links without one bearing upon the other.

The manufacture of such groups of compression resistant flat link chains is relatively cheap, whereas the reliability of service and the resistance against buckling and compression are high.

According to a preferred construction of the invention chain links are used the length of which amounts to a multiple of the pitch of the chain pins. The middle axes of the pins are fixed to connecting links in such a manner that the connecting links extend about half the pitch of the pins beyond the centre links. Hereby a fork is formed into which engages the pivot pin of the next following centre link. These connecting links may be constructed as locking hooks which engage the oppositely arranged elongated chain pins and lock the chain. The locking hooks may detachably be connected to the centre links.

The centre chain preferably serves as a counter bearing for the chain pins of the two cooperating chains so that disengagement of the chain pins from the teeth of the driving gears or of the reversing wheels is prevented.

In the accompanying drawings some constructions according to the invention are shown by way of example.

In these drawings:

Figure 1 shows a group of flat link chains in which the links of the two oppositely acting chains bear against each other,

Fig. 2 is a cross section on line II—II of Fig. 1,

Fig. 3 shows a modification, in which the opposite links of the chains are interlocked without bearing against each other,

Fig. 4 is a cross section on line IV—IV of Fig. 3,

Fig. 5 is a plan view of the construction shown in Fig. 3,

Fig. 6 shows a side elevation of another construction of chains according to the invention,

Fig. 7 is a section on line VII—VII of Fig. 6,

Fig. 8 is a detail view on a somewhat larger scale, and

Fig. 9 is a section on line IX—IX of Fig. 6.

The group of chains consists of three flat link chains *a*, *b* and *c* all of which are connected by bolts to the body to be lifted. The oppositely arranged chains *a* and *b* are each driven by a

sprocket wheel and constitute the lifting members proper of the lifting gear. The sprocket wheels of the two chains *a* and *b* are coupled by a pair of gears so that they are simultaneously driven with the same number of revolutions. The distance the two sprocket wheels are spaced from each other is so chosen that the hook-shaped chain links *g*, *h* of the chains *a*, *b* constructed as shown in Figures 3–5 securely interlock as soon as they reach the vertical position after having moved over the sprocket wheels.

The third chain *c* operates between the two chains *a* and *b* and is turned about 90° with respect thereto so that the links of the chains *a* and *b* come into contact with those of the chain *c* and are pressed against the links of the latter as soon as the hook-shaped links *g* and *h* of the chains *a* and *b* are in engagement. If, however, narrower links are chosen for the chain *c* then instead of the links the pins *d* and *e* of the chains *a* and *b* will bear against the links of the chain *c*.

After the engagement of the chains *a*, *b* and *c* a cross section of I shape results as shown in Figure 4, which, when pressure is exerted upon the group of chains, cannot deflect to any side and, therefore, is resistant against buckling.

The chains *a*, *b* and *c* may also be constructed as shown in Figures 1 and 2 of the drawings.

In this case, the links of the chains *a* and *b* are so formed, that the bores for the link pins *d* and *e* are not arranged in the centre of the links, but are spaced from the longitudinal edge of the links facing the sprocket wheels in the smallest distance allowed to ensure sufficient strength of the links. The force acting upon the flat link chain therefore, is eccentrically applied. The lengths of the chain links are so dimensioned that in stretched position of the chains the links always are in contact with each other. To render the chains movable towards one side only, the two inner edges of the links facing the sprocket wheel, are to be rounded off at a radius corresponding to half the inside length of the links. The two other edges, however, remain intact, so that the chains cannot deflect in the direction of the side of the chain at which the rounded off edges are located.

The arrangement of the chains *a* and *b* is as above described, but it is to be observed, that the not rounded off edges of the links of both chains are facing each other.

The chain *c* operates between the two chains *a* and *b* and is turned about 90° with respect thereto. For this purpose, however, a narrow chain comes into consideration the links of which come into contact with the pins *d* and *e* of the chains *a* and *b*. The pins *f* of the chain *c* therefore, are countersunk in the outer links of the latter.

After the chains have passed the sprocket wheels, an I-shaped cross section results. Due to their eccentrical formation the chains *a* and *b* cannot bulge outwardly when pressure is applied. Bulging towards the interior is prevented by the chain *c* operating between the chains *a* and *b* and turned about 90° with respect thereto. In case of great buckling lengths, hook-shaped links *g'* and *h'*, similar to the links *g* and *h* shown in Figures 3–5, are provided, which are secured in a definite spaced relation to the eccentrical links outside the latter so that by the interengagement of such hook-shaped links these links themselves are particularly interlocked.

According in the preferred construction shown in Figs. 6 to 9 as low a number of individual links and pins as possible is used to reduce to a minimum the wear of the chain and thereby to extend its usefulness. As may be seen from the drawings, a chain link consists of a single centre link *r* of a thickness as large as possible and two connecting links *q* of a smaller thickness. The length of the chain links, moreover, amounts to a multiple of the pitch of the pins. One of the pins *i* provided at the end, either the upper or lower pin of each link is pivotally arranged, whereas the other pins *e* are fixed to the appertaining chain links and serve as driving pins. The chain links are unsymmetrically constructed. The bores for the reception of the pins are not arranged in the centre of the link but are spaced from the longitudinal outer edge of the link in the smallest distance allowed to ensure the required strength of the latter. Facing this side the links are rounded off as described above, whereas towards the inner side of the group of chains they are extended exactly half the pitch of the pins at right angles to the axis of the chain. In the stretched position of the chain, the latter may, as explained already, bulge towards one side only. A further simplification of the chain with regard to the constructions already described is obtained by the fact, that the centre links *r* located between the symmetrically constructed inner and outer links *q* only are unsymmetrically formed relatively to the chain *a* and *b* respectively. The symmetrical inner and outer links *q* are fixed to the centre links *r* and the parts of the links *q* having the bore *i* receiving the chain pin extend about half the pitch of the pins beyond the appertaining centre link *r*. Between these extended portions of the links *q* the centre link *r* of the following chain link engages. Due to the outer links *q* being fixed to the centre link *r*, a safe guidance of the latter connected to the pivot pin *i* in the fork so formed is obtained and a lateral deflection or giving way of the centre links *r* of the entire chains *a* and *b* under compressive strain of the chain is excluded. Moreover, owing to this construction the centre links *r* must, in the stretched position of the chain, positively occupy a position in a line extending in parallel to the axis of the chain.

In connection with chains having links which may pivot about all chain pins, however, under compressive strain the centre links may be displaced in a vertical direction relatively to the chain pins, particularly if the latter are not exactly fitting and if a certain wear of the pins or the holes receiving them has occurred respectively. Even after wear this is impossible with the chain according to Figs. 6 to 9. If in this case also the connecting links extending to the centre links would connect the pins provided at the ends of the same only then here again two pivot points would be present between two centre links, whereby the above mentioned drawbacks would be caused. As indicated, however, each two connecting links belonging together are rigidly connected to a centre link by a plurality of chain pins, so that between each two centre links one pivot point only is present i. e. in the end extending beyond the connecting links. Hereby all centre links of the chain positively are adjusted in parallel to the axis of the chain in the stretched position of the latter.

The two gears *k* engage the two chains *a* and *b*. A disengagement of the chain pins from the gears *k* is prevented by the centre chain *c* as the latter simultaneously forms the required counter

bearing. After the chains *a* and *b* have passed the gears *k* they are guided over the sprocket wheels *l*. The pitch of the teeth of the sprocket wheels corresponds to the distance the pivot pins of the chain links are spaced from each other. The sprocket wheels *l* are so arranged above the gears *k* that the pivot pins of the chains moving upwardly when engaging the appertaining space between the teeth of the sprocket wheels are still pressed against the centre chain, whereby deflection or disengagement of the pins is prevented. In definite distances from each other the outer connecting links are provided with hooks *h* which, after engaging the opposite elongated chain pins *s* mutually lock the chains *a* and *b*, whereby, after the chains having passed the sprocket wheels, a rigid compression resistant unit is obtained below the gears *k*. A simplification of the locking with regard to the already described locking arrangements is obtained by the fact that locking hooks are provided in definitely spaced distances from each other on one chain only, whereas elongated chain pins *s* engaging the locking hooks *h* only are provided at the opposite chain instead of locking hooks.

Locking and releasing respectively of the chains *a* and *b* by the locking hooks *h* and the oppositely arranged elongated pins *s* is effected during movement of the chains *a* and *b* towards the sprocket wheels and away from the latter at these wheels and not, as described above, at the lifting gears *k*. To ensure a uniform load of the chains *a* and *b* on lifting and compressing respectively, the lower ends of the chains *a* and *b* are pivotally connected to a compensating device *n*.

The centre chain *c* is connected to the body or member *p* to be lifted at the point o of application of the chains *a* and *b* and extends between the latter upwardly until the roller *m* mounted above the sprocket wheel *l* is reached. A relative displacement of the chains in the direction of the axis of the latter is impossible.

The group of flat link chains according to the present invention shown by way of example in vertical position may also be used in any other inclined position, for instance in connection with mitred lock gates of sluices and the like.

KARL BENDER.

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K. BENDER
COMPRESSION RESISTANT CHAINS
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Serial No.
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3 Sheets-Sheet 1

Fig. 1

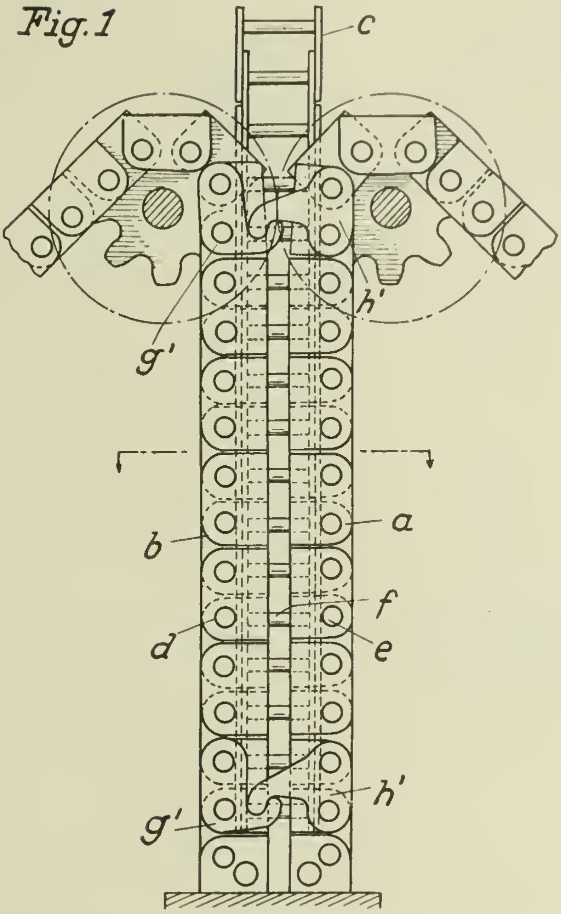

Fig. 2

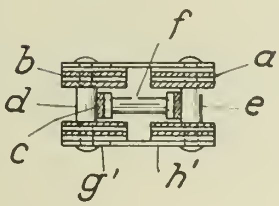

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Fig. 3

Fig. 4

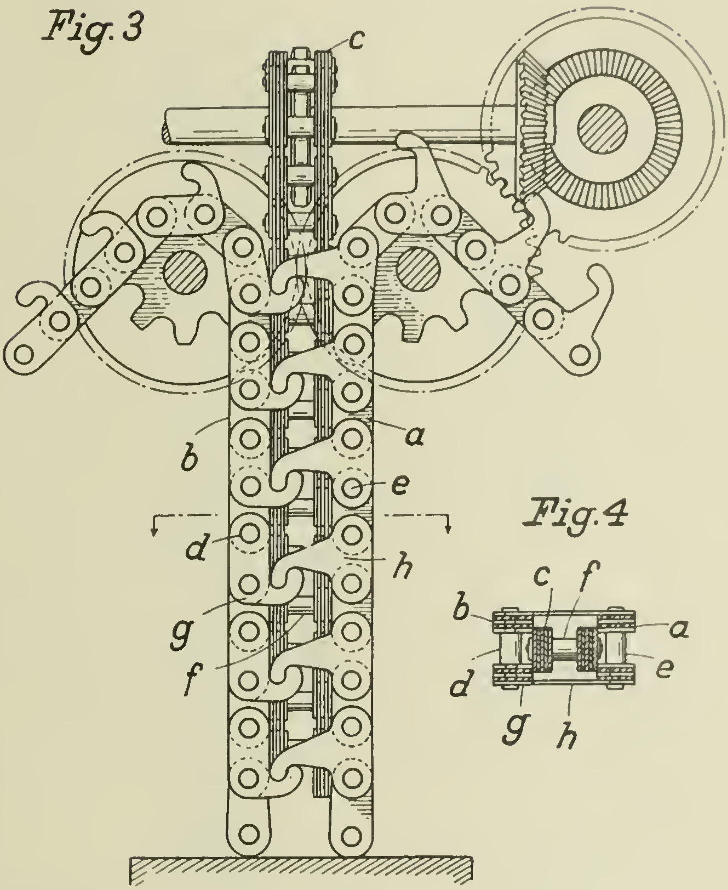
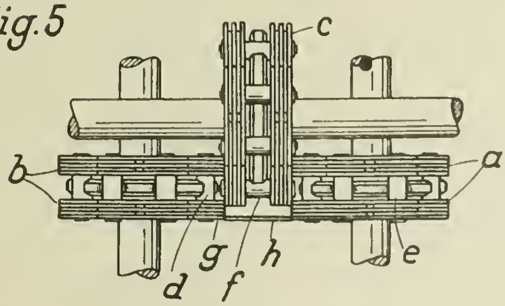


Fig. 5



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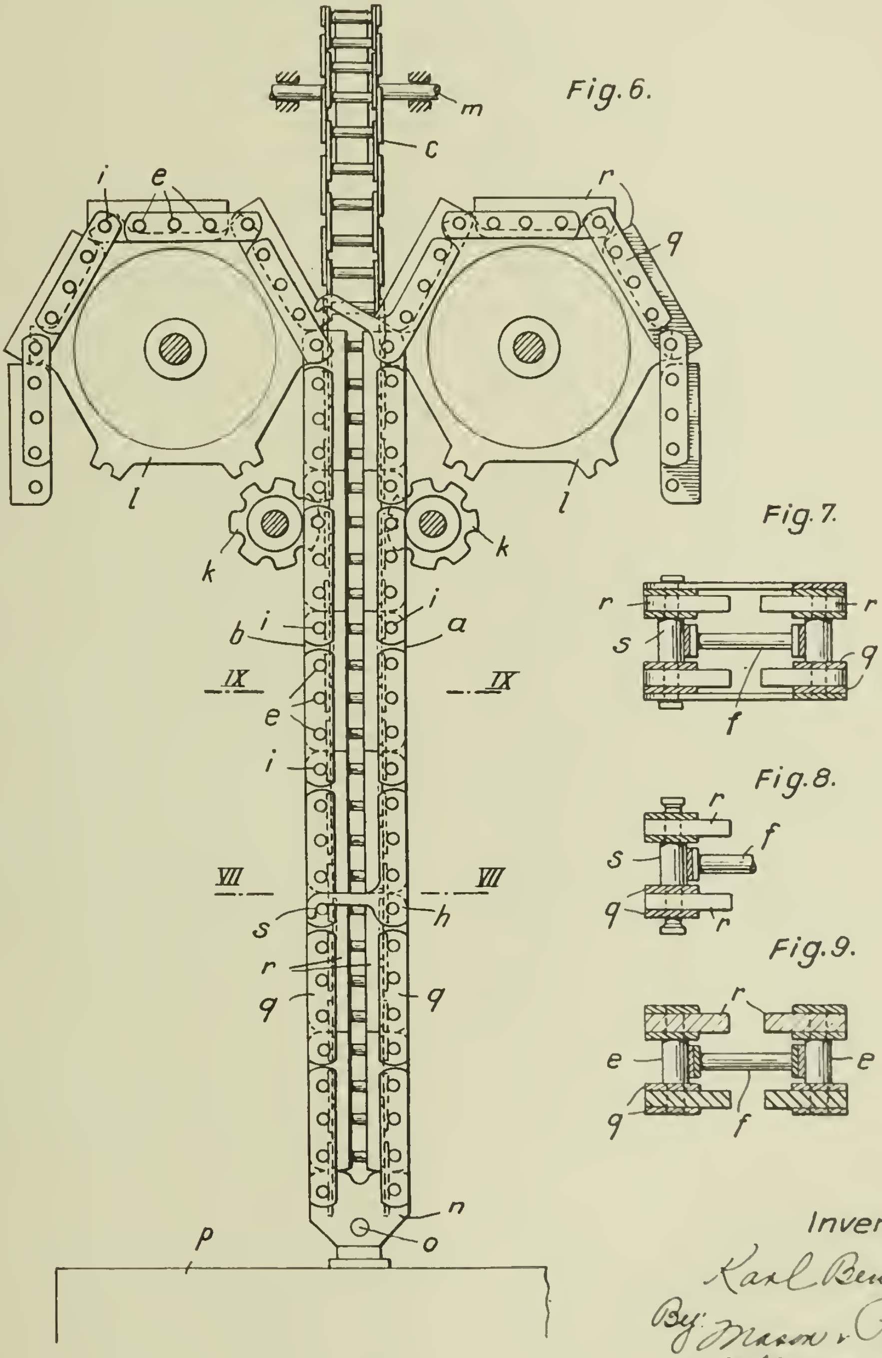
3 Sheets-Sheet 3



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ALIEN PROPERTY CUSTODIAN

COMPRESSION RESISTANT GROUP OF FLAT LINK CHAINS

Karl Bender, Wurzburg, Germany; vested in the Alien Property Custodian

Application filed September 29, 1941

The present invention relates to a compression resistant group of flat link chains which is suitable in all cases in which loads are to be lifted and/or to be pressed downwardly. The invention particularly is adapted for use in connection with lifting gears of sluices, flood or lifting gates, mitred lock gates and the like.

The group of flat link chains consists of two oppositely acting flat link chains, adapted to be wound up in the same plane, whereby these two flat link chains mutually bear against each other for the purpose of forming a compression resistant group of flat link chains.

Each individual flat link chain consists of links pivotally connected to each other. The portions of the links located above the upper pivot pin are provided with nose-like projections facing the cooperating chain, and these projections are so arranged that the edges of the noses of the one chain bear against the edges of the noses provided on the cooperating chain so that in this manner a mutual support of the two chains is obtained.

Moreover, individual links of the flat link chains may be provided with hook-shaped members which serve the purpose of locking and act upon pivot pins of the counter or cooperating chain.

The arrangement may also be such that two hooks engaging each other are provided in staggered relation at the two flat link chains. These pairs of short locking hooks are provided in spaced relation from each other. With this construction, groups of flat link chains are provided which, even when provided with relatively short links, offer a very large resistance to compression.

Each individual link of each chain need not necessarily be provided with a nose-like projection, but in some cases a nose at each second or third link only is sufficient. In connection with flat link chains having an additional hook locking a still smaller number of noses may be sufficient.

If not each flat link of each chain is provided with noses, the links not having noses preferably are constructed as connecting links, as for instance as relatively short and small links, whereas the links carrying noses and connected to each other by the connecting links are relatively long and fitted with driving pins. The connecting links may then be connected to the upper link member by two driving pins so that, therefore, the connecting link cannot move with regard to the upper chain link.

The construction of the noses carried by the links of the flat link chains may be effected in various ways. So for instance the noses may be integral with webs rigidly connected to the chain links.

It may be of advantage to provide plates or the like to be shifted upon the upper portion of the chain link. In case of a chain consisting of links provided with connecting plates or the like, these noses preferably extend as far as to the connecing plates or links. By using such sifted on noses the webs of which, surrounding the centre links, extend as far as to the connecting links, the latter bear against the webs of the noses as soon as the chains occupy a stretched position and, therefore, said links cannot move further towards the centre of the two flat link chains. A mutual displacement of the individual centre flat links, therefore, is counter-acted.

Preferably at the lower ends of the centre links cams are additionally provided which are so constructed that the upper portions of the centre links bear against these cams as soon as the flat link chains occupy the stretched position. By this construction a mutual displacement of the centre links is absolutely prevented and, moreover, the advantage is ensured that after leaving the sprocket wheels, the flat link chains are positively brought into a perfect stretched position between the sprocket wheels and the object or member to be moved. Outward buckling of an individual flat link chain under compressive strain is possible towards one side only and this also in the case, that the front surfaces of the centre links are not bearing against each other, so that, therefore, an increase of the buckling strength is obtained.

In the accompanying drawings some modifications of groups of flat link chains constructed in accordance with the invention are shown by way of example.

In these drawings:

Fig. 1 is a side elevation of a group of flat link chains,

Fig. 2 is a cross section through the group of link chains according to Fig. 1,

Fig. 3 shows a side elevation of a modified construction of a group of flat link chains provided with locking hooks,

Fig. 4 is a side elevation of another modification provided with long chain links and connecting links,

Fig. 5 shows a side elevation of a group of flat link chains carrying pushed on noses and pairs of hooks,

Fig. 6 is a section on line VI—VI of Fig. 5,

Fig. 7 is a section on line VII—VII of Fig 5,

Fig. 8 is a side elevation of a group of flat link chains having additional cams, and

Fig. 9 is a section on line IX—IX through the group of flat link chains according to Fig. 8.

The two flat link chains *a* are so constructed as to oppositely act at compressive strain and to be unable to bend or flex in a direction away from each other.

As shown in Figs. 1–4, the ends of the chain links *r* and *q* located above the uppermost pivot pins are provided with nooses *v*. These nooses *v* project beyond the inner edges of the centre links *r* so far, that, after leaving the driving wheels *k*, they contact each other in the centre plane of the two flat link chains *a*, without any clamping actions being possible during movement of the flat link chains over the wheels *k*. The provision of the noose-like projections *v* at the chain links has the effect that the two flat link chains mutually support, so that a further intermediate member, for instance a special bearing chain, is not required.

If the flat link chains are loaded by compression they act in opposition to each other in such a manner as to be safe against bulging in any direction.

To increase the breaking strength of the chains at greater lengths, locking hooks *h* may be provided spaced in definite relation from each other.

The two flat link chains *a* are provided, as shown in Fig. 4, with elongated links and the centre links *r* are provided with riveted driving pins *e* and with a pivot pin *i*. The connecting links *q* are fixed to the centre links *r* by the driving pins *e* and extend for half the pitch of the chain beyond the lower end of the centre link *r* and engage the pivot pin *i* of the following centre link.

In this construction the upper portion of the centre links *r* located above the pivot point *i* only is provided with nooses *v*.

Instead of these nooses *v* flat iron webs of the same thickness and width may be welded to said portions which connect the two centre links of a flat link chain. The use of the flat iron webs *v* effects, that, on eventual displacements of the two flat link chains in the direction of the axis of the chain pins, a safe bearing of the individual oppositely arranged pairs of centre links against each other is ensured on compressive load of the chains. In connection with this construction also more particularly at larger breaking lengths of the chains locking hooks *h* may be provided spaced in definite distances from each other.

As shown in Figs. 5–7 the nooses *v* are shifted over the parts located above the upper pivot pin of the two members of the centre links *r* of both chains in such a manner that the two shanks of the nooses *v* extend over the centre links *r*. They may be riveted, screwed or welded to the centre links. The shanks of the nooses *v* extend over the centre links *r* as far as to the connecting links *q* so that, when the flat link chains are stretched, the links *q* bear against the shanks of the nooses *v*.

In definitely spaced distances from each other locking hooks *h* are provided. The latter may be fixed to one of the flat link chains and be so constructed that they engage with an elongated chain pin of the oppositely arranged chain as soon as the flat link chains are stretched.

However, to maintain the distance *s* from the centre of the driving wheel *k* to the outermost edge of the locking hook as small as possible during winding off of the chain from the driving wheel and consequently to utilize the space above the lifting gear as much as possible, preferably short locking hooks are provided at both flat link chains which, when the latter are stretched, engage each other and lock the chain against pressing apart from each other or bulging.

To prevent jamming occurring during locking and to ensure a locking free of objection, the hooks *h* are staggered about one chain link.

Besides the nooses serving bearing purposes and provided at the upper end of the centre links *r* and the locking hooks not designated and provided at the connecting links *q*, cams *w* may, as shown in Figs. 8 and 9, be provided at the centre links *r* of both flat link chains below the lower pivot pin. These cams *w* are fixed at one or both sides of the centre links, for instance by riveting, screwing or welding. The position of the cams and the shape of the latter must be so chosen that, when the flat link chains are stretched, one sides of the cams strongly bears against the inner side of the connecting links *q*. Preferably each link of the chains is provided with such a cam which, of course, may consist of several parts.

KARL BENDER.

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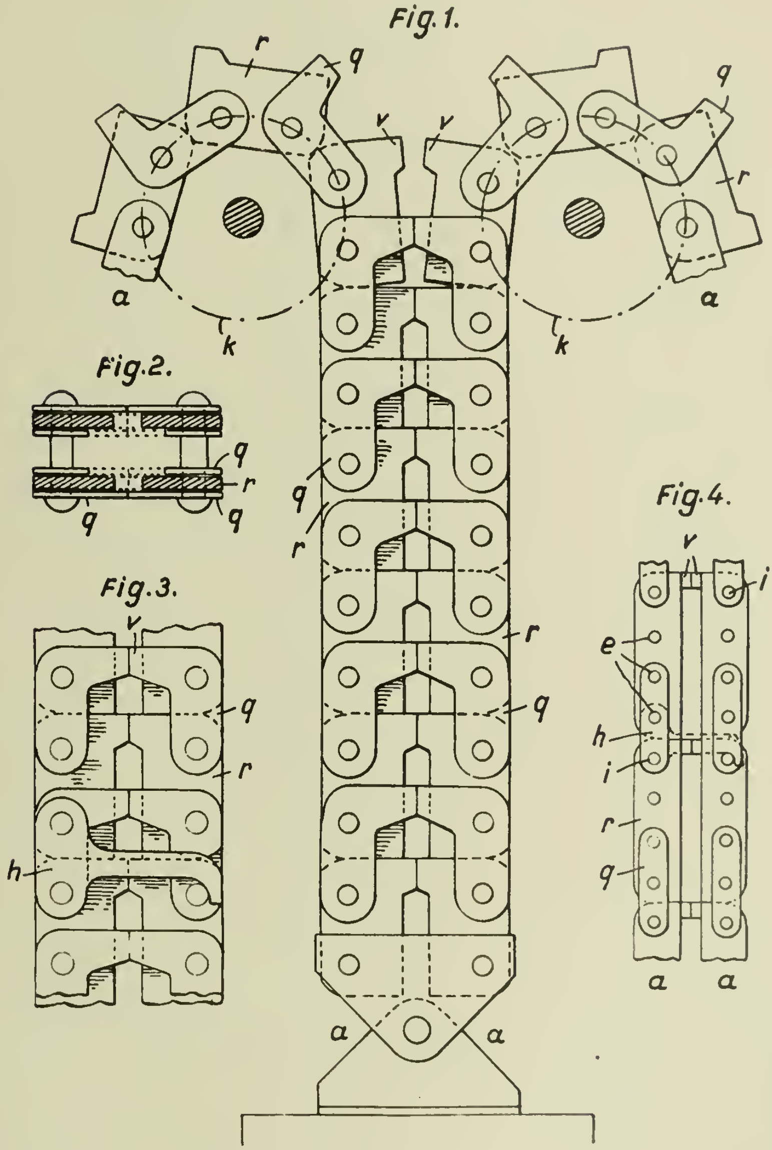
2 Sheets-Sheet 1



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BY A. P. C.

K. BENDER
COMPRESSION RESISTANT GROUP
OF FLAT LINK CHAINS
Filed Sept. 29, 1941

Serial No.
412,905
2 Sheets-Sheet 2

Fig. 5.

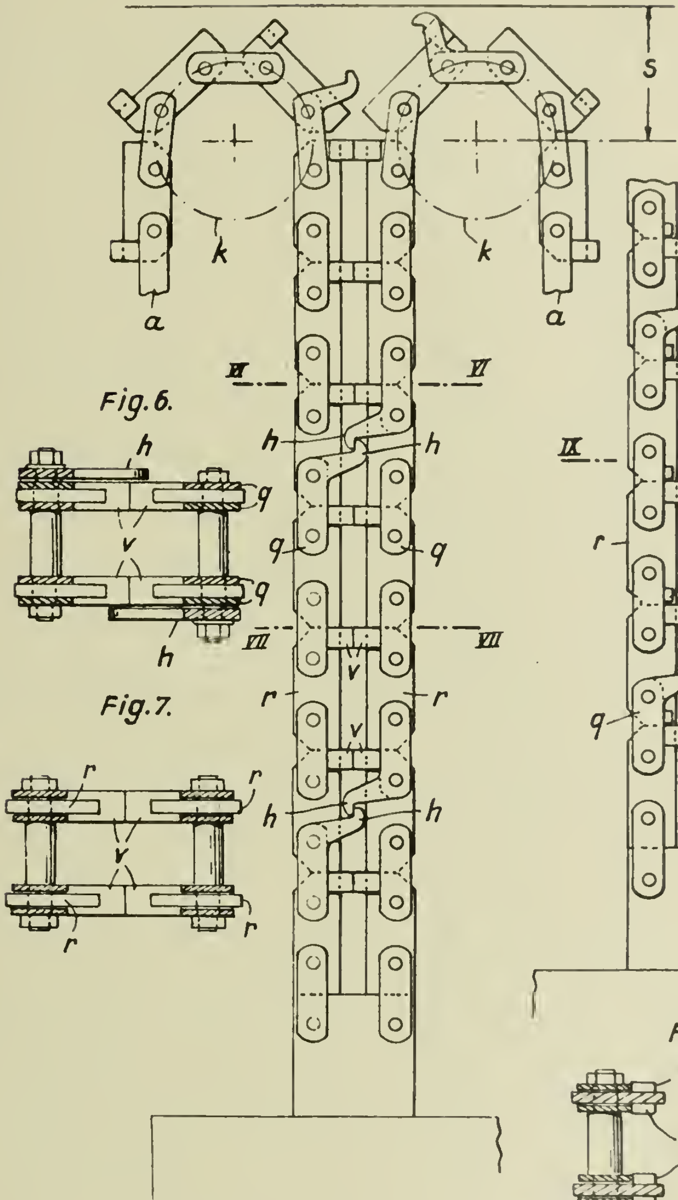


Fig. 6.

Fig. 7.

Fig. 8.

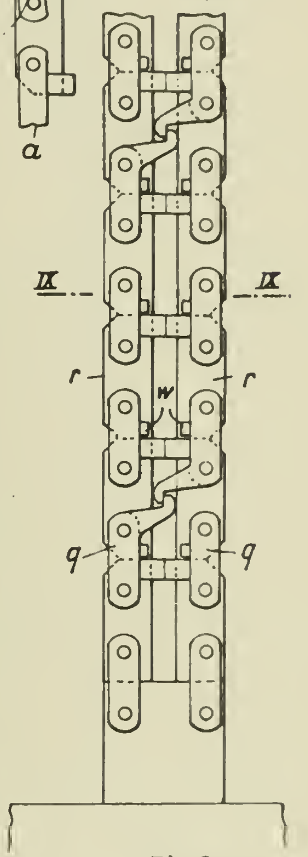
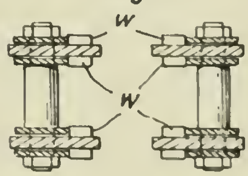


Fig. 9.



Inventor:
Karl Bender
By: Mason & Porter
Attorneys

Published May 18, 1943

Serial No. 413,022

ALIEN PROPERTY CUSTODIAN

PILL BOXES

Berend Jan van den Dool, Deventer, Holland; vested in the Alien Property Custodian

Application filed September 30, 1941

This invention relates to boxes or containers and has special reference to boxes for pills, tablets and the like.

It is quite common to provide boxes for pills and the like wherein an opening is provided of proper size to allow the contents to escape one by one and to provide a slide, lid or cut-off to keep such an opening closed. However in the sale of such boxes there is no way of determining (by the customer) whether or not the box has been opened and some part of its contents abstracted so that the purchaser would not receive a full box. It has been proposed to guard against such removal of part of the box contents by pasting a paper sealing strip around the box at the factory, any opening of the box being indicated by removal or breaking of the strip. This method is not entirely satisfactory since the paper strip sometimes may be slipped off the box, some of the contents abstracted and the strip replaced unless the strip is adhesively secured to the box itself. Even when so secured the effect is not satisfactory because boxes of this character are usually ornamentally or otherwise printed on the exterior and a strip of paper used for sealing purposes destroys the display of such printing and thus hinders sales.

It is one important object of the present invention to provide a novel sealing arrangement for such a box, so devised that the sealing means will be impossible to remove without detection.

A second important object of the invention is to provide an improved closure means for such a box, the means requiring no extra material.

A third important object of the invention is to provide a construction for the seal or closure which is of such nature that the seal may be opened by one's thumb nail or a simple implement like a pen knife or nail file.

A fourth important object of the invention is to provide an improved construction for the purpose set forth, wherein the seal used will not interfere with the ornamentation of or printing on the box.

With the above and other objects in view, as will be presently apparent, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and particularly claimed.

In the accompanying drawings like characters of reference indicate like parts in the several views, and:—

Figure 1 is a top plan view showing the outer box cover open and the seal in place.

Figure 2 is a section on the line **2—2** of Figure 1.

Figure 3 is an enlarged detail view of one corner of Figure 1 but with the seal or closure broken off and the delivery hole open.

Figure 4 is an enlarged detail section on the line **4—4** of Figure 1.

In the construction of the invention as here shown there is provided a box body having a bottom **10**, a front wall **11**, side walls **12** and a rear wall **13**. These walls extend upwardly from the bottom at right angles thereto and the box bottom may be made as a sheet metal stamping or from cardboard, plastic or other suitable material. Preferably the side walls merge into the front and rear walls by arcuate corners **14**. A cover **15** is secured to the rear wall **13** by a suitable hinge **16** and is of a shape and size to conform to the open top of the box body, the cover being flanged at **17** to fit against the walls of the body.

Fitted in the box body is an inner box having a top **18** from which depends peripheral side walls **19** arranged to fit tightly against the inner surfaces of the walls **11**, **12** and **13**. Adjacent one corner of the top **18** there is provided a delivery opening **20** of a size to permit the pills or the like held in the box to pass out through this opening one at a time. This opening is preferably formed by cutting an arcuate slit **21** in the material of the box, the slit being slightly more than 270°. The cutting of this slit provides a tab or seal **22** which, until the inner box is opened, is attached to the top **18** along a weakened line **23**. The seal **22**, in process of manufacture is bent up adjacent the line **23** as at **24** and is then bent to provide a portion **25** parallel to and spaced above the top **18**. By means of this construction a thumb nail, knife blade or the like may be inserted at **26** and the seal pried up which, due to the weakened line **23**, will break it free from the top **18** so that once the seal has been raised it cannot be replaced. Thus, if the box has been opened for access to its contents, the absence of the seal will afford warning of such tampering with the box.

In filling the box the desired contents may be placed in the body before the top **18** has been applied. Then the top may be placed in the box body and, if desired, soldered or otherwise secured against removal. The cover **15** having been closed the box is ready for shipment and sale.

BEREND JAN VAN DEN DOOL.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

B. J. VAN DEN DOOL

PILL BOXES

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Serial No.
413,022

Fig. 1.

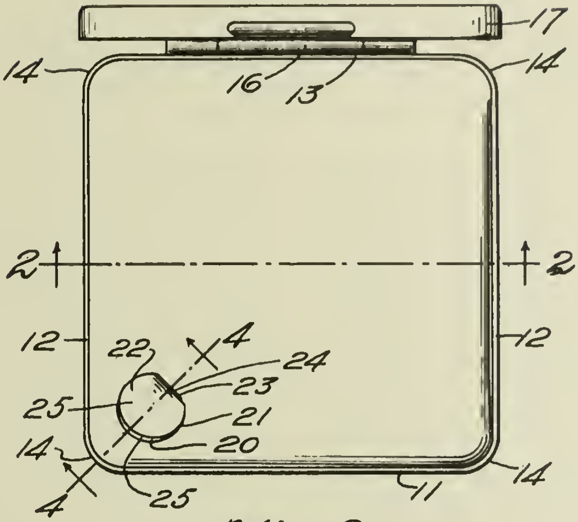


Fig. 2.

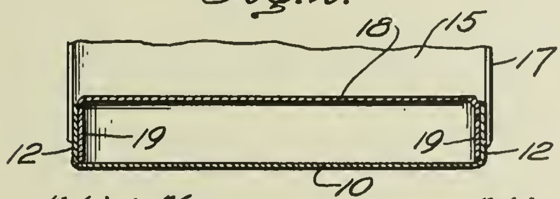


Fig. 3.

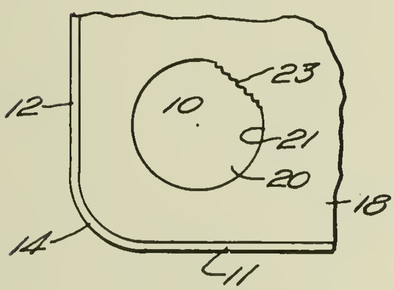
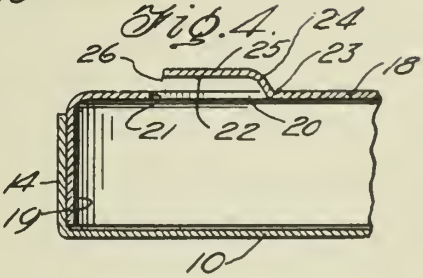


Fig. 4.



Inventor

Berend Jan van den Dool,

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Attorneys

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Serial No. 413,380

ALIEN PROPERTY CUSTODIAN

METHOD FOR MAGNETIC SOUND RECORDING

Hans Joachim Edler von Braunmühl and Walter Weber, Berlin-Charlottenburg 9, Germany; vested in the Alien Property Custodian

No Drawing. Application filed October 2, 1941

This invention relates to an improved method of magnetic sound recording, especially with the aim to lower the background noise, and therefore with the possibility to enlarge the dynamic range of reproduction.

As commonly known, the magnetic sound recording is effected upon a paramagnetic material, preferably a steel wire or steel tape. This tape is moved with constant velocity along the pole pieces of a recording head fed by the currents to be recorded. The tape will thus be impressed with remanent variations of its magnetic properties which can be again converted into electric currents by passing the steel wire or tape along a properly constructed reproducing head.

It is known, that there arise serious difficulties with this simple method of recording and reproducing sound, as far as the fidelity and the lack of distortions are concerned. The reasons for these difficulties are for example: the non-linear character of magnetisation of a magnetizable body relative to the magnetic flux; phase shifts, hysteresis effects and so forth. Besides that there are the problems of erasing the past magnetic history of the tape, and of getting good recordings of the feeble signals as well as of the strong ones without distortions and rectifying effects by cutting off the half-waves.

Several possibilities are known for wiping out former recordings. Usually the tape is exposed to the influence of a strong constant magnetic field. Before recording, the magnetisation must be returned to a midpoint on the B—H curve or else to a neutral state. This is done by a polarizing magnetic field the direction of which is opposite to the first one. This method would be quite allright for a paramagnetic recording material with ideal magnetic properties. But experience showed that even the best tapes or steel wires available give serious difficulties by hysteresis effects, by the frequency dependence of the permeability and that of the inductivity of the recording head.

It is further known to wipe out past recordings by a high frequency current, thereby bringing down the magnetisation to the zero point of the B—H curve, and returning afterwards prior to the recording the magnetisation of the tape to an optimum value of said curve. This method, however, does not eleminate any of the difficulties mentioned.

Furthermore it has been proposed, to use a high frequency current superimposed to the speech currents for recording, hereby agitating the recording body. But even this procedure does not diminish the difficulties mentioned above.

In order to overcome all these difficulties, especially the inhomogeneity of the tape or wire in its magnetic properties, the dependence of frequency of the permeability as well as of the inductance of the heads, it has been also proposed to supply to the recording head high-frequency currents modulated in the rhythm of the low-frequency currents to be recorded. In using this method, the recording body has to be magnetized up to saturation before recording. With no signal frequency present, the tape will be demagnetized by the recording head down to a midpoint of the B—H curve. Recording is then effectuated up and down from this point within the extreme limits of saturation and zero-magnetisation.

It has been considered as advantage that in this method the whole recording energy is concentrated within a very small interval, namely within the carrier frequency and between both side bands. The difficulties arisen by the fact that both permeability and inductivity depend remarkably upon frequency are in this way eliminated, and the recording is free from serious distortions. This effect would not at all have been reached by simply superimposing radio frequency upon signal frequency; as in this case the interval of the utilized frequencies would not become smaller, as desired, but much more larger.

All these methods mentioned above have been developed chiefly to improve magnetic sound recording of telegraph signals or of speech currents, where no special stress was to be laid upon high quality. The measures proposed are by no means appropriate to ensure a perfect degree of reproduction e. g. of musical recordings. Even by using high frequency currents according to the prior art, the background noise which must be considered the most annoying factor cannot be suppressed down to a sufficiently low value.

The reason for this fact is a double one.

Firstly: The high frequency currents energizing the recording head involve eddy currents of considerable strength in the steel tape, the magnetic fields of these eddy currents reacting upon the recording field. According to the magnetic inhomogeneity of the metallic tape or wire the intensity of the eddy currents will vary from one point to the other even when no signal current is present, thus producing a variable reaction upon the recording field and therefore upon the impressed magnetism. When reproduced the variable magnetisation induces corresponding noise currents in the reproducing head. The

effect described above is not only a theoretical deduction but can be easily verified by experiments. Therefore it is shown that a perfect magnetic recording depends upon an absolute elimination of reaction of the tape towards the recording field.

Besides that the best suppression of background noise will be ensured by taking measures to bring the tape—with no speech currents present, that is in the intervals of performances—to an absolutely unmagnetic state when leaving the recording head. Such a neutral tape is quite unable to induce noise currents in the coils of reproducing heads.

This demand of completely neutralizing the magnetic state of the tape in the case when no desired speech current is present can be fulfilled by exposing the tape leaving the head to a high frequency alternating magnetic field, the influence of which upon the moving tape decreases continuously down to zero. This measure resembles well to the technical demagnetisation of ferro-magnetic bodies. Here the strength of the alternating field will be gradually decreased with the effect that the magnetic state of the body follows to smaller and smaller hysteresis loops. The difference between this technical procedure and the method proposed above is simply, that we do not change the magnetizing current, but remove gradually but continuously the point to be demagnetized out of the magnetic sphere of the head.

As explained above our invention consists in superimposing to the low frequency current to be recorded a relatively strong high frequency current, and in doing this to eliminate at one hand the reactions of the tape or wire upon the field of the recording head by properly choosing the material or the properties of the tape itself or by properly designing the head, and on the other hand to take precautions that the tape leaving the recording head will be exposed to the influence of a magnetic field which—as a function of distance from the head—decreases continuously down to zero.

The reaction of eddy currents produced in the tape under the influence of the high frequency currents upon the recording field can be eliminated by using a non-magnetic tape of sufficient rigidity with a magnetizable cover, the paramagnetic particles of which are insulated one against the other. In a surface of this type no eddy currents can be induced. The particles mentioned can be enclosed in an insulating cement the layer of which forms a cover of the non-magnetic film. A tape of this type has been described p. e. in German Patent No. 500,900.

The second condition to be fulfilled is the field which ensures a gradual continuous demagnetization of the tape leaving the recording head. The well known double pole open heads are not appropriate to cover this demand. In such a head we have two types of magnetic fluxes: between the pole pieces we have the direct flux or main flux which connects on the shortest path the pole pieces; outside this region we have the stray flux the intensity of which corresponds to a fraction (say ⅓) of the main flux. This stray flux has a direction opposite to that of the main flux. Therefore a magnetic particle of the tape coming from the main flux passes a point of zero field strength which represents besides that a point of phase turning, and enters then the region of stray flux. The field form described does not correspond to the demands for a continuous demagnitization of the moving tape; it may be added that the decreasing stray flux alone is not able to produce a complete demagnetization because of its lower intensity. The disadvantages explaned above do not occur with heads of other construction, especially with circular heads which touch the tape only from one side. The field of heads of this type corresponds to the characteristics to be insisted upon.

HANS JOACHIM EDLER VON BRAUNMÜHL.
WALTER WEBER.

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Serial No. 413,551

ALIEN PROPERTY CUSTODIAN

PROCESSES FOR TREATING BAGASSE

Manuel L. Roxas, Manila, P. I.; vested in the Alien Property Custodian

Application filed October 3, 1941

The present invention relates to a bacteriological-mechanical process of treating bagasse for the production of pulp stock, plastic powder material and fines for filler in paper board, furfural distillation, or briquet manufacture for fuel or directly as fuel.

One of the objects of the invention is to convert last mill bagasse by bacteriological means involving the employment of selectively-fermenting micro-organisms into a high cellulose containing and easily workable bagasse material suitable for the production of pulp which can be utilized for high grade paper making purposes.

Another object of the invention is to treat the last mill bagasse by means of a selected strain and specially cultured micro-organism derived from the liquid of some naturally fermenting vegetable material, in conjunction with proper environmental media so as to enhance the growth and fermenting activity of the micro-organism inoculated for the purpose of eventually reducing principally the pectin, sugar, ash, wax, and to a light extent, the lignin contents of the bagasse material.

A further object of the invention is to subject the last mill bagasse to a process which involves selective bacterial fermentation, washing, removal of the excess moisture subjecting the fermented bagasse to the action of the disintegrator and followed by drying and screening the fibered material to separate the chemical pulp stock, the medium sized fibers suitable for mechanical pulp, plastic powder manufacture or low grade chemical paper stock and the fines for furfural distillation, or to be used directly as fuel or in the form of briquets or as filler for paper board or plastics.

Still a further object of the invention is to provide for a very economical process of treating bagasse and manufacturing pulping material suitable for transport by a series of biological and mechanical processes as herein described below.

Further objects of the invention will become apparent from the descriptions and claims herein below given:

The fundamental principle of the present invention is the selective action of the different micro-organisms on vegetable matter as affected by the strain of the micro-organism used and the conditions under which the reaction takes place, the rendition of the bagasse by the fermentation treatment to an easily workable material for the succeeding mechanical operations and the separation of the bagasse material into portions suitable for separate and distinct uses.

While I am aware that bagasse has been subjected to microbiological reaction for preservation purposes and for converting the bagasse into semi-pulp material, I am not aware that it has been proposed to treat bagasse by a bacteriological-mechanical process to obtain different portions of the bagasse which are suitable for separate and distinct purposes as herein described below.

My process contemplates the following steps substantially in the sequence recited, although my invention is not limited thereto, the invention being set forth in the appended claims namely:

1. The inoculation of the last mill bagasse with bacteria cultures dispersed in aqueous solution containing the desired bacteria.
2. The fermentation of the said admixtures under carefully controlled conditions until the complete elimination of the sugars and other undesirable substances in the bagasse.
3. The washing of the fermented bagasse material; first to remove for use elsewhere part of the fermenting micro-organism, and second, to wash out the soluble substances.
4. The removal of the hydrostatic water in the material by passing through a three-roller mill.
5. The disintegration or fibrillation of the bagasse material by the action of the hammer mill or disintegrator.
6. Drying the fibrillated material in a dryer of a conveyor type with the use of hot air.
7. The fractional separation of the various grades of products by screening.
8. The coarse material may be baled for transport or converted to higher quality pulp; the medium grade is suitable for the manufacture of mechanical pulp, plastic powder or low grade paper stock and the fine grade, for furfural distillation, for fuel directly or in the form of briquet, or as filler or constituent of paper board and plastic boards.

A specific application of the process is as follows:

The bagasse as it comes out of the last mill is led through a conveyor to the fermenting boxes in the fermentation room. While on the conveyor, the material is inoculated with the desired fermenting micro-organism by sprinkling it with a suspension of the bacteria. The inoculated material is piled up in covered fermentation rooms and allowed to ferment for from twenty to forty eight hours, or any convenient length

of time. The bagasse after fermentation is then loaded on conveyors and sent to the expression mill. On the way to the expression mill the bagasse is washed first with cold water to collect the fermenting bacteria, and then with hot water to remove the soluble substances. The first washing is returned to the bacterial spray tank to serve as dispersing medium for the micro-organism and the hot water washings are thrown away or disposed of in some convenient manner. The wet material is passed through a three-roller mill to reduce the water content to about 70 per cent. It is then fed into a hammer mill or disintegrator wherein hot air is introduced while the material is fibrillated or disintegrated. The resulting fibrillated product consists of fibers of various lengths and comminuted pithy materials. The products are exhausted from the hopper of the hammer mill and blown to a storage bin, from which it is led to conveyor type of dryer heated with a countercurrent of hot air. The comminuted material comes out at a moisture content of about 10–15%. The separation of the fibers may conveniently be done by either of the following ways:

(1) Blowing to a semi-circular set of screens whereby the fines pass through the screen and the fibers are blown on and fractionally separated into the medium and coarse fractions, the coarser ones being blown farther.

(2) By passing thru a cylindrical shaking screen with a helical type of conveyor. Upon being shaked, the fines pass thru the slots of the screen, the medium fibers drop down at the end and the coarser fibers are conveyed outside. The coarser fibers are high in cellulose content, low in ash, hence suitable for paper making purposes either chemical or mechanical. The fine material contains more of the undecomposed pectinous and lignous substances and is low in cellulose content, and suitable as raw material for furfural distillation or briquet making or as filler.

The process is best used with bagasse coming directly from the last mill of the central but it can also be applied to properly preserved material.

As a further disclosure of the invention, I may say that my fermenting micro-organism was not isolated from bagasse though it may accidentally be found in it, but from some naturally retting ramie in the Industrial Laboratory of the Technical Department of the National Development Company, Manila, P. I., propagated in a culture medium containing agar 25 grams, sucrose 10 grams, peptone 10 grams, and salt mixture 5 grams per liter. The salt mixture is composed of:

	Parts by wt.
$(NH_4)_2HPO_4$	50
K_2HPO_4	50
$MgSO_4$	10
$NaCl$	10
$CaCl_2$	10
$FeSO_4$	1

The bacterium is cultured in solutions of gradually increased pectin content. The culture is transferred into bagasse sufficiently submerged in water and to which the salt mixture is added in the proportion of 1.310 grams of the mixture to every liter of water used. This culture solution is the one inoculated directly into the bagasse. The inoculation is applied at a rate of around 50 gallons to a ton of bagasse. In the course of fermentation, heat and acidity are developed that no special precaution as to sterility is needed. The micro-organism was found to be attacking the pentosan, wax, and sugar contents of the treated material.

While the invention has been described in connection with a particular layout, it is obvious that it is by no means dependent on the particular equipment or arrangement indicated. The invention may be carried out in any device in which the operating conditions of the process as herein described are present.

MANUEL L. ROXAS.

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M. L. ROXAS
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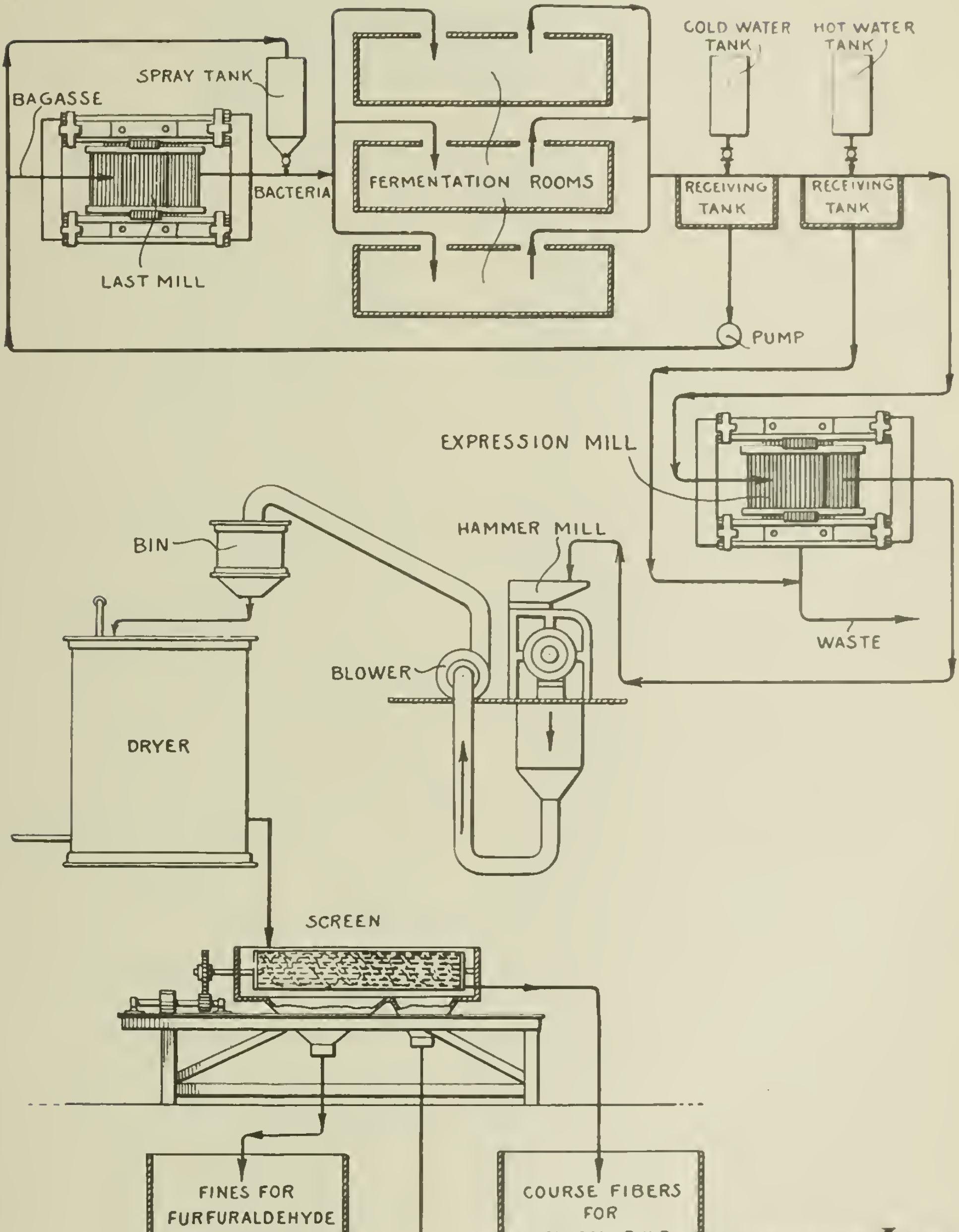

Inventor:
Manuel L. Roxas
By Jacobi & Jacobi
atty.

Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

DEVICE TO BE USED IN CONNECTION WITH MOTOR VEHICLES AND ADAPTED TO PREVENT DAMAGES OF MUD GUARDS, HEADLIGHTS AND OTHER MEMBERS OF THE CARRIAGE BODY OF MOTOR VEHICLES

Erwin Hitzelberger, Rohr, Germany; vested in the Alien Property Custodian

Application filed October 4, 1941

The present invention relates to a device to be used in connection with motor vehicles and adapted to prevent damages of mud guards, headlights and other members of the carriage body of motor vehicles during opening and closing of engine bonnets provided with a plurality of bonnet members hingedly connected to each other.

With regard of the clefts present due to the mud guards and headlights and owing to their low own stability, these relatively large and substantially unstiffened engine bonnets may, with much trouble only, be brought into and out of their position of rest without stumbling against members of the carriage body so that in a relatively short period of time the members of the carriage body lying in the range of the swinging movement of the engine bonnet are scratched and consequently subjected to a rapid corrosion.

The engine bonnets known already and formed as blinds or links displaceably mounted in the longitudinal direction of the vehicle respectively could not remedy this trouble, because such motor bonnets, besides requiring an unnecessary additional space, due to stresses, particularly twisting stresses of the vehicle body, occurring on account of unevennesses of the track or road, very soon loose their exact guidance and jam during opening and closing. Moreover, the slightest damages of the motor bonnet are sufficient to render them immovable.

Relatively to the known devices, the novelty of the present invention consists in positively guiding in a curved way the free ends of freely swingably hinged parts of the motor bonnet. According to a further modification of the invention the corners of the freely swingably hinged parts of the engine bonnet are guided by the aid of projections by rails arranged at the body of the vehicle and defining the swinging range of the bonnet free of obstacles. These projections may be non-resilient and provided with axially displaceable rollers.

In the accompanying drawings the invention is shown by way of example.

In these drawings:

Fig. 1 is a side elevation of the front portion of a motor vehicle,

Fig. 2 shows a perspective view of the front portion of a motor vehicle illustrating the positively guided engine bonnet in the open position,

Fig. 3 is a cross section on the line **3—3** in Fig. 1 through the motor bonnet showing in elevation the upper end of the guide rail,

Fig. 4 is a cross section on line **4—4** of Fig. 1 through the motor bonnet illustrating in elevation the lower guide rail slightly bent towards the motor, and

Fig. 5 is a cross section on the line **5—5** of Fig. 4 through the guide rail shown in Fig. 4.

To prevent damaging of the mud guards, headlights and the like during opening and closing of motor bonnets provided with a plurality of hingedly connected bonnet members *a*, *b* the free ends *c* of the freely swingably arranged members *b* of the engine bonnet are positively guided. According to the construction shown in Fig. 2 the positive movement of the bonnet members is effected by arranging at both sides of the engine bonnet, at the front wall *d* of the carriage body *e* and at the side of the cooler *f* facing the motor, hollow rails *g* in which run the rollers *h* mounted on the projection *i* fixed to the free ends *c* of the freely swingably hinged members *b* of the engine bonnet.

The rails *g* are so arranged that during opening and closing of the bonnet the members of the latter are prevented from stumbling against any of the members of the carriage body.

As shown in Figs. 2 and 3 a supporting notch *k* is provided at the upper end of the rails *g* into which drops the roller *h* carried by the projection *i* when the bonnet is opened so that the latter is kept in the opened position. As illustrated in Fig. 4, the lower end of the rails *g*, however, is slightly bent in the direction of the motor, whereby pressing of the bonnet members *a* and *b* against their supporting points *l* in the closed position of the bonnet is ensured.

As, however, the rails *g* provided at the same side of the engine bonnet, due to the different shapes of the bonnet, not always extend in parallel to each other, the projections *i* are resilient in the direction of gauge alteration, see Fig. 5. This resiliency, however, may also be obtained in connection with rigidly arranged projections *i* by the fact that the rollers, eventually loaded by springs, may be axially displaced which, however, is not shown in the drawings.

Within the scope of the invention, links pivoted to the vehicle body and hingedly connected to the members of the engine body and which eventually are loaded by springs may be provided instead of the guide rails mentioned above.

In a further form of construction links, preferably spring loaded, are provided at suitable points of the vehicle, i. e. two points near the front and rear of the bonnet and on the upper part of it, e. g. on the radiator and on the front wall of the carriage body.

ERWIN HITZELBERGER.

PUBLISHED

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BY A. P. C.

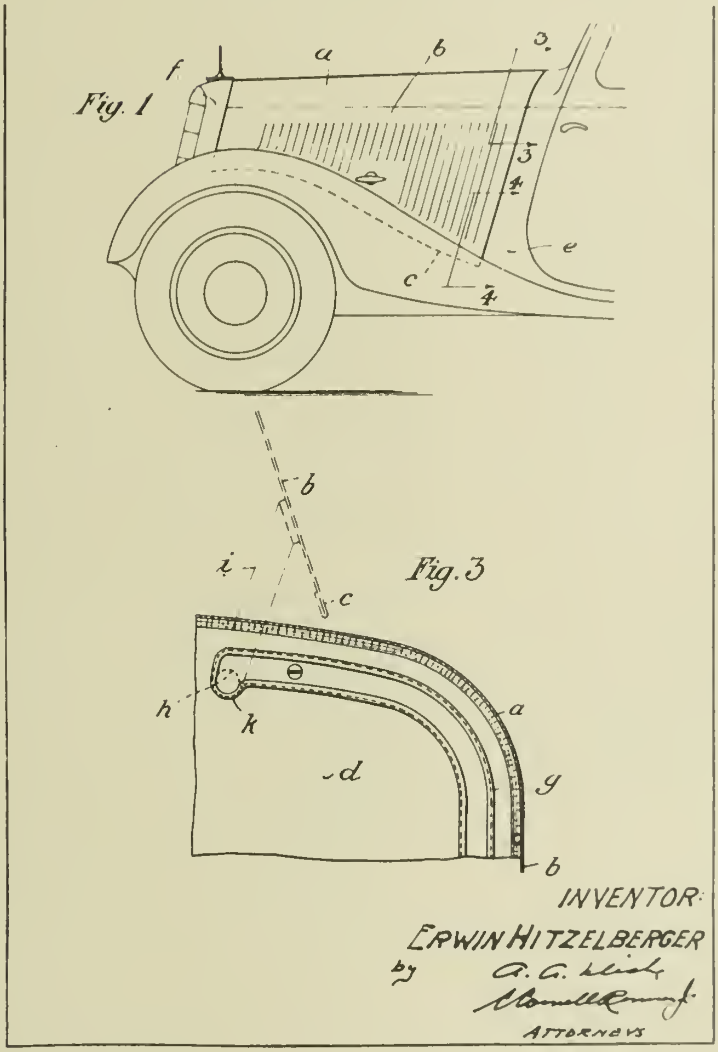
E. HITZELBERGER

DEVICE TO BE USED IN CONNECTION WITH MOTOR VEHICLES AND ADAPTED TO PREVENT DAMAGES OF MUD GUARDS, HEADLIGHTS AND OTHER MEMBERS OF THE CARRIAGE BODY OF MOTOR VEHICLES

Filed Oct. 4, 1941

Serial No. 413,658

2 Sheets-Sheet 1



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DEVICE TO BE USED IN CONNECTION WITH MOTOR VEHICLES AND ADAPTED TO PREVENT DAMAGES OF MUD GUARDS, HEADLIGHTS AND OTHER MEMBERS OF THE CARRIAGE BODY OF MOTOR VEHICLES

Filed Oct. 4, 1941

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2 Sheets-Sheet 2

Fig. 2

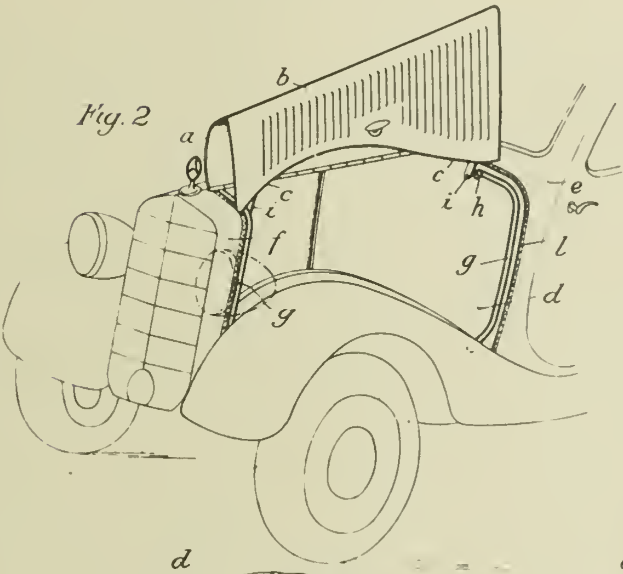
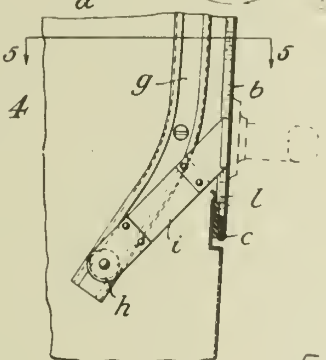


Fig. 4



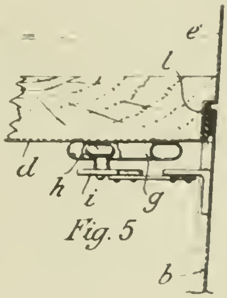


Fig. 5

INVENTOR:
ERWIN HITZELBERGER
by
ATTORNEYS

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ALIEN PROPERTY CUSTODIAN

SEMI-TUBULAR SECTION WITH LATERAL FLANGES FOR USE IN MINE GALLERY FRAMING

Karl Maria Groetschel, Bochum, Germany; vested in the Alien Property Custodian

Application filed October 7, 1941

For several decades past it has been proposed to use tube halves equipped with flanges in conjunction with rock bodies and squeezable intermediary layers in vaulted adit framing heads, such tube halves forming likewise full cylinders when matched and representing in part the props serving to support the vault head. However, this semi-circular section with lateral flanges similar to the familiar cable protecting irons never gained any importance in casing or walling galleries despite the advantages it offered from the point of view of construction. There is no doubt that this method was completely ignored in practice for gallery walling owing to its insufficient staying quality to prevent gaping of the channel and its otherwise inadequate resistance against deflexion in consequence thereof.

The purpose of the present invention is to reform this familiar but, owing to its deficiency, practically useless gallery casing section and turn it into perfectly suitable shapes by revising or supplementing its design incidentally making it, if possible, superior to other known mine gallery casing sections. In accordance with the invention, this is achieved substantially by the following measures:

To start with, it is proposed to increase the thickness of the curved parts of the walls of the section steadily toward the center of the channel. In this manner, the channel wall is given a crescent-like section and, consequently, the section is assured a considerably increased degree of stiffness preventing any gaping of the flanges.

Generally, the growing reenforcement in accordance with the invention will presumably be of such a nature that the wall of the section at the perpendicular plane will be several times as thick as the thinnest portion of the rest of the channel wall, at least, however, about one and three quarter times as thick. In such a way, a degree of stiffness against gaping may be obtained in the section surpassing by far that of the channel-shaped sections known to be employed in mining practice and not possessing the crescent-like shape of the channel walls in accordance with the invention. The increased resistance against gaping increases considerably the effective value of the moment of resistance W_x of the section, the fact being that this decreases rapidly with the growing expansion of the channel section.

Furthermore, the advantage of the novel mine gallery framing is demonstrated by the fact that it is considerably better safeguarded against any bursting or splitting of the channel bottom in longitudinal direction than the channel-shaped adit framing sections known, such an occurrence—whereby the endurance of the whole gallery framing is greatly weakened and the re-use of the section is made impossible—being by no means infrequent. This longitudinal tearing open of the section as a rule occurs along the center of the bottom of the section. But at this point precisely, the turning point of the section halves producing a lever effect, the section in accordance with the invention is most strongly reenforced and, in addition, the gradual decrease in the thickness of the wall from the center towards the arm ends takes into consideration in an ideal manner the lever-like tendency of the section arms, particularly as regards the efficient distribution of the material.

Owing to the excellent degree of safety, the section in accordance with the invention affords against gaping and being torn open, the same may be most readily bent into curve or ring shape. For the same reason, the section is eminently suited for adoption in an arrangement by pairs for yielding or resilient casing in which the exterior section owing to the interior section being forced into the exterior one, is exposed to the additional danger of being bent or/and torn open.

The crescent-like shape of the channel section is formed effectively not only by the semi-circular curvature of the interior and exterior channel, but the curves may also take the shape of a parabola, or the like. In accordance with the invention it is recommended as especially advantageous to employ sections of semi-elliptic form or similar to a semi-elliptical form. This permits the use of a channel with steeply ascending arms and yet gradually increasing wall thickness with an even curvature beginning at or near the flange roots up to the perpendicular center plane of the section. This is of particular importance in cases where the section should show comparatively high moments on the axis x, for which purpose the channel must be narrow and deep. Long-armed channel sections of this kind also are provided with an extremely high degree of stiffness in the sense indicated, if shaped in accordance with the invention. Furthermore, even with a channel of considerable depth they may still be rolled with ease. As a matter of fact, any shapes in accordance with the invention may be rolled with greater ease

than any of the known casing sections which are more or less angular at the channel bottom.

For the purpose of obtaining the crescent-like shape of the principal part of the section wall in accordance with the invention, it is not necessary that both lateral faces of the section be curved in one and the same way within the scope of the curve types proposed; on the contrary, one may for instance to advantage give the inner wall of the main part of the channel semi-circular shape, while the exterior face may receive a continued curvature of semi-elliptical or similar shape, the reverse also serving as an eventuality to a certain degree.

In case of selecting a semi-circular shape for the curvature of the channel faces of the novel casing section, the lateral walls are supplemented in accordance with the invention by substantially straight-faced webs in continuation of the curved part of the channel, if the section required is a deep and narrow one. The same holds good in case flat semi-ellipses are preferred for the curvature of the channel faces.

It may be mentioned at this point that a flanged trough-shaped section has become known as a component part of a dissimilar pair of gallery casing sections, the inner faces of which are bent inwardly in a circular fashion, the interior bottom face also being curved inwardly, so that the interior section face resembles a parabola. This section, however, does not show the crescent-like shape of the channel wall in accordance with the invention and, consequently, it lacks the corresponding advantages, because the exterior faces of the webs, in spite of being circular as well, are curved toward the outside and the outside face of the bottom is of level shape. Said trough section does not possess the same high degree of rigidity resisting spreading of the channel section, nor can it be rolled as easily as the sections in accordance with the invention that have no corners or edges at the bottom. In addition, there is the considerable disadvantage that this trough section cannot be made up into a pair by insertion with a substantially similar and equivalent channel section, so that it will not fill the requirement of an efficient and resilient or elastic gallery casing frame.

For the purpose of converting the fundamental section in accordance with the invention into a section suitable for gallery casing and superior to other shapes it is proposed, furthermore, to make the flanges heavier and thereby bring their masses into favorable relation to the mass of the gradually strengthened bottom of the channel. Short-levered, substantially square, or short-length, substantially rectangular flanges decidedly would be given the preference over long-stretching shapes representing long lateral levers with the tendency to favor the gaping of the channel; and, as a rule, the thickness of the flanges will be several times that of the smallest dimension of thickness of the channel arm.

With reference to the drawing, the nature of the invention will now be further described and explained:

Fig. 1 shows the familiar semi-tubular section 1 mentioned in the beginning and resembling a cable protecting iron. The dotted lines 1′ indicate how the original section in accordance with the invention loses its shape under the pressure of the rock.

Fig. 2 shows a specific design according to the invention by way of example In this case the crescent-like shape of the main part 2 of the channel wall is formed by two eccentric semicircles. As may be seen the channel wall increases gradually several times in thickness up to the center point, starting at the root 3 of the flanges 4, where its thickness corresponds to that of the original section, 1, indicated in this drawing by a dotted line. The flange starting at the ends of the curvature extend to the same width as the flanges of the original section 1. Their thickness, however, is also increased several times up to the point of reaching about a square section. The gradual increase in the mass of the material in the main part of the channel wall is compensated for by the heavier design of the flanges, in such a way, that the axis of symmetry and the neutral axis of the section coincide approximately. Thus, from the unstable, weak original section 1 a new gallery casing section of extraordinary resistance against gaping and tearing, with at the same time improved relation of the static values is created.

Fig. 3 shows a pair of sections formed of two similar sections in accordance with the invention, and especially adapted for constructing composite and resilient casing frames. A certain amount of clearance may be provided between the channel bottoms. They differ from the section according to Fig. 2 in that the main part 2, and 2′ respectively, of the channel wall is not provided with the flanges 4, and 4′ respectively, in an immediate continuation of the ends but with the intercalation of short and straight-faced webs 5, and 5′ respectively. In this way, greater depth is given to the channels, the resistance moment Wx benefiting thereby, and the moments of inertia Ix and Iy being still closer adjusted one in relation to the other. As indicated by dotted lines, the flanges 4′ of the exterior section may be provided with a groove or similar recess on their lower side, in such a way, that clamping devices may be adapted to it in a hook-like manner.

Fig. 4 shows another pair of sections in accordance with the invention held together by a novel clamping device. The cross sections of both channel shapes, as shown, are bordered in this case on both sides by lines resembling half ellipses, in such a way, that the section wall has its thickness increased several times gradually starting from the flange roots, to the perpendicular center plane of the section. Contrary to the aforementioned examples and the casing iron sections of the lining type, with this pair of sections the channel depth is considerably greater than the channel width. This fact together with the other features of the design in accordance with the invention, brings about that the interrelation of the inertia moments is radically changed as compared with the section cited in comparison, the moment Ix now surpassing moment Iy. It may be mentioned here that there is in existence an American channel section possessing strong lateral flanges and a narrow and deep channel which is used in tunnel construction as a skeleton rib center profile for supporting concrete timbering. This profile, however, would not be suitable for actual mine gallery casing, the frame work of which is composed, as a rule, of individual profiles. To a still higher degree than is the case with the fundamental profile of cable protecting iron type in accordance with the invention or the planking iron-like gallery casing sections, this profile lacks among other features a reliable reinforcement of the channel; as a matter of fact, precisely at the turning point of the section halves

where the wall must be strongest, this profile has by far its weakest part, being weaker even than the webs.

As in the design of a mine galley casing section the danger of lateral buckling also must be considered, the moment of inertia Iy must not be allowed, in relation to Ix, to fall below the point at which the direct or indirect friction of the profile at the gallery section joints no longer affords a sufficient supplement to the lateral stability of the section. As a rule, the latter will be the case when the value Iy falls below half the value Ix.

In cases, therefore, where a section resistant to bending stresses is of prime importance, it is proposed to design the cross sections of the shapes according to the invention in such a way that the moment of inertia Iy is smaller than the value Ix. At the same time, moment Ix should not surpass moment Iy by more than one and a half the latter's value.

There is a demand for channel shapes of this type principally in mine galleries of considerable span, such as for instance loading stations, gallery junctions, and the like, where, even if the frame work is given a round form, the bending or transverse strains will be more apparent, as a rule, than crippling strains. Furthermore, sections of this type may be employed to advantage in those cases of smaller spans where arch-like frames are used, the lateral parts of which have to show a comparatively large radius of curvature in view of the gallery height required, or in part cannot be given any curving at all. Such parts of the gallery frame work are exposed to a special degree to the danger of bulging out toward the gallery interior when impulsive pressure is existent, and in the headways to the danger of bulging out into the worked space, as long as the packing serving in this case as an abutment to the frames has not yet been introduced.

KARL MARIA GROETSCHEL.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

K. M. GROETSCHEL

SEMI-TUBULAR SECTION WITH LATERAL FLANGES FOR USE IN MINE GALLERY FRAMING

Filed Oct. 7, 1941

Serial No. 414,002

2 Sheets-Sheet 1

Fig ~~Abb.~~ 1

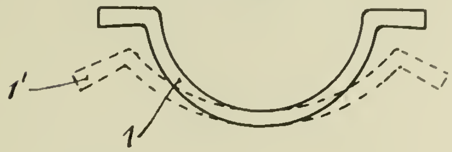


Fig ~~Abb.~~ 2

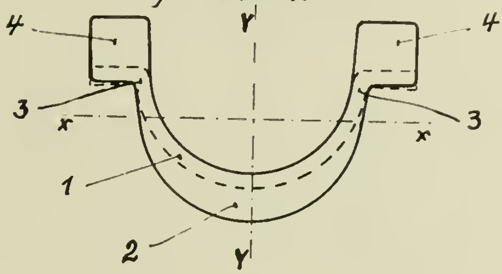
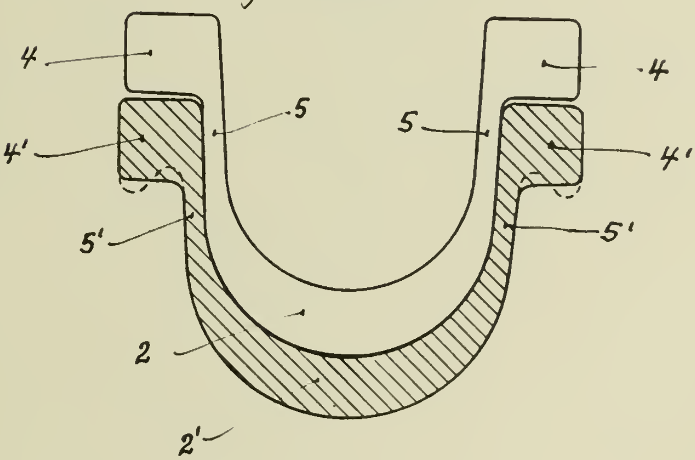


Fig ~~Abb.~~ 3



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K. M. GROETSCHEL
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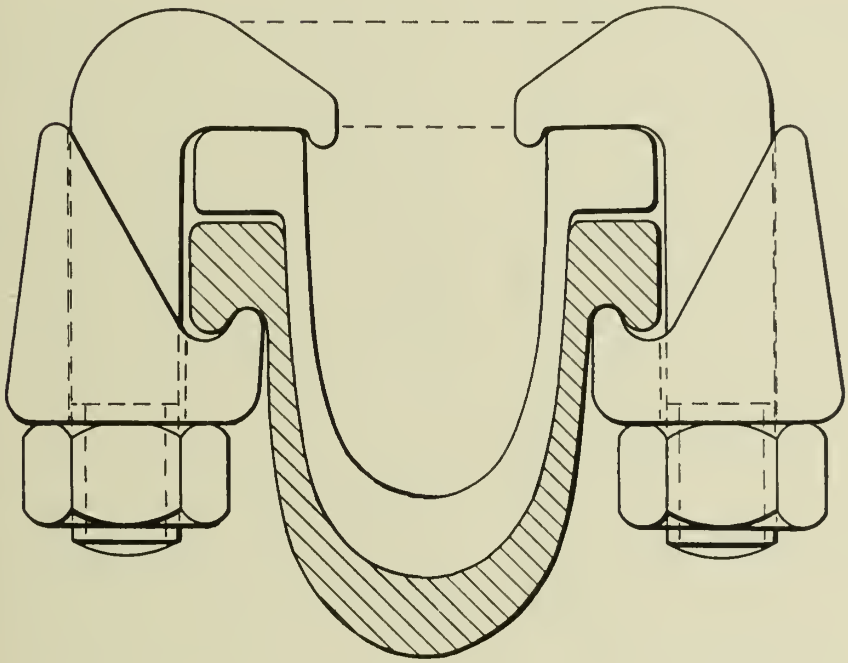
Serial No.
414,002
2 Sheets-Sheet 2

Fig. ~~Abb.~~ 4



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ALIEN PROPERTY CUSTODIAN

ELECTROLYTIC SYSTEM

Pietro Achille, Milan, Italy; vested in the Alien Property Custodian

Application filed October 7, 1941

This invention relates to electrolytic systems comprising cells having a mercury cathode and more particularly to systems comprising electrolytic cells of the above said type in communication with compartments where the mercury amalgam formed in said cell is decomposed, the flow of said amalgam and the regenerated mercury from one of said containers into the other being obtained by increasing and decreasing the pressure in one of them.

It is known that in the electrolytic systems having a mercury movable cathode, a continuous or discontinuous substraction of amalgam from the electrolytic compartment is necessary in order to maintain the percentage of the alkaline metal within the limits affording a good stability of the amalgam, so as to make possible the use of the amalgam and the regeneration of the mercury.

For such a purpose in the cell arrangements now in use, the flow of the mercury or of the amalgam from one of the two containers disposed side by side, into the other, is obtained by gravity, while the passage of the amalgam, or regenerated mercury from the latter container into the former is obtained by means of elevators, lifting worms, pumps or the like.

The main object of the present invention is to obtain the necessary flow of amalgam and regenerated mercury without requiring any mechanical device for lifting them.

Another object of the invention is to provide an electrolytic system comprising an electrolysis compartment and a decomposition compartment connected with each other in such a way as to constitute a system of communicating tubes, so that by means of a pressure increase in one of said compartments, a flow of amalgam or mercury from said compartment into the other takes place, and when the pressure in said compartment decreases the liquid flows in the other direction.

A further object of the invention is to provide means for obtaining the desired pressure variations in said compartments. Such variations may be obtained for instance, by varying the pressure of a gaseous means which is extraneous to the electrolytic process which takes place in the cells or compartments, or by varying the pressure of the gas developed in the chemical reaction which occurs in said compartments, or by varying the levels of the liquids upon the amalgam contained in said compartments.

These and other objects and advantages are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a diagrammatic sectional view of an electrolytic system where the pressure variations are effected controlling the discharge of gas developed in one of the containers.

Fig. 2 is a diagrammatic sectional view similar to that of Fig. 1, where the pressure variations are effected by controlling the discharge of the liquids contained in the cell.

Fig. 3 is a diagrammatic sectional view of another arrangement of electrolytic cells and compartments according to the invention.

Referring to the drawing and more particularly to Fig. 1, **1** is an electrolytic cell, **2** the compartment in which the mercury amalgam is decomposed, and **3** a pipe connecting the bottom sections which contain mercury of both said containers.

The cell **1** contains a saturated solution of sodium chloride, where by electrolysis a sodium amalgam and development of chlorine are obtained.

The pipe **4**, discharging chlorine from the cell, is provided with a stopping device **5** for opening and closing, intermittently, the chlorine discharge. Such a controlling discharge device may be constituted by a rotary or Corliss valve having its movable member, rotating at a predeterminated speed, or by a piston device having predeterminated stroke and speed, or the like.

Said controlling device may also be arranged on a chlorine discharging pipe connecting many electrolytic cells.

The operation of the described system is as follows: the electrolytic process is started when the controlling device **5** is in its closed position and compartment **2** at a constant pressure. By electrolysis, sodium amalgam is formed and gaseous chlorine developed in cell **1**; as said gas cannot flow out cell **1**, pressure in said cell increases and an amount of amalgam is pushed from cell **1** into compartment **2**. In said compartment **2** said amalgam is decomposed, sodium hydroxide and hydrogen are formed and regenerated mercury is obtained. The controlling device **5** is so adjusted that it allows chlorine passage in pipe **4**, when a certain amount of amalgam is decomposed in compartment **2**; then pressure in cell **1** decreases so that some mercury flows through pipe **3**, from compartment **2** into cell **1** so that new amalgam will be obtained during the opening of controlling device **5**.

The process then continues as above described.

The greater is the speed of the movable member of the controlling device 5, and the smaller are the pressure variations in cell 1.

The same results may be obtained arranging the controlling device 5 on the pipe 6 which discharges hydrogen from compartment 2, instead on said pipe 4.

In Fig. 2, 7 is the electrolytic cell and 8 the compartment where the amalgam formed in cell 1, is decomposed. Both said compartments 7 and 8 have their lower sections connected with a trough 9 having a mercury sealing. In Fig. 2 only two compartments are shown but they may be more than two and arranged in any suitable manner without changing operation and results.

The electrolyte which is a saturated solution of sodium chloride, enters cell 7 through pipe 10 in a continuous or discontinuous manner and leaves said cell through pipe 11 in a discontinuous manner, as for instance through syphon device 12. When the feeding of the electrolyte is continuous, the discharging device 12 has to have a capacity greater than feeding pipe 10.

When the electrolytic process is started, if the liquid level in the compartment 8 is maintained constant and electrolyte is continuously fed to cell 7, the liquid level in said cell increases till the level of syphon 12 and the pressure on the amalgam increases too, so that an amount of said amalgam is pushed from cell 7 into compartment 8. In said compartment 8 said amalgam is decomposed as in the described case of Fig. 1.

When the liquid level in cell 7 reaches the level of the syphon 12, some liquid is quickly discharged and the pressure in cell 7 decreases. Then, the mercury regenerated in the electrolytic compartment 8 may pass again into the cell 7 in order to take up a new amount of sodium. Such a process is performed in a continuous and efficient manner and the resulting advantages are obvious.

In Fig. 3 there are an electrolytic cell or compartment 14 and two compartments 15 and 16 for the amalgam decomposition. Both said compartments 15 and 16 are connected with cell 14 at their lower section containing mercury, through troughs 17 and 17′ both having mercury sealing.

In the compartments 15 and 16 the sodium amalgam is decomposed by means of solutions of sodium hydroxide in the presence of a conducting material as iron or graphite which must be in contact with both amalgam and hydroxide.

Owing to the amalgam decomposition, a concentration of the alkali solution results and hydrogen is developed.

In said compartments 15 and 16 the sodium hydroxide solution is fed in a discontinuous manner through feeding pipes 18 and 18′ and it is discharged in a discontinuous manner through syphons 19, 20 and 19′, 20′.

During the operation of the cell, if the system is arranged in such a way as to have an increase of the liquid level in compartment 15, equal to the lowering of the liquid level in compartment 16, while the liquid level in cell 14 remains constant, a flow of regenerated mercury from compartment 15 into cell 14 and a flow of the same amount of amalgam from cell 14 into compartment 16, are obtained. In such a way, the distance between the mercury cathode and the anode 21 of cell 14 remains invariated during the operation, so that the inner electric resistance of the cell remains the same and the terminal voltage is constant. In the system illustrated in Figs. 1 and 2 said distance between cathode and anode was variable and the inner electric resistance of the cell was in said cases not constant. The synchronisation of the movements of the liquids in compartments 15 and 16 which cause the mercury displacements, may be obtained, for instance, by means of pumps 22, 22′ one of which pushes the alcali solution discharged from compartment 15, into compartment 16 and the other pushes the solution discharged from compartment 16, into compartment 15.

The water necessary to the reaction is introduced into compartments 16 and 15 in a continuous or discontinuous manner, through the feeding pipes 23, 23′ and the alcali obtained by chemical reaction in said compartments, is discharged in a continuous or discontinuous manner through discharge pipes and valves 24 and 24′.

PIETRO ACHILLE.

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P. ACHILLE
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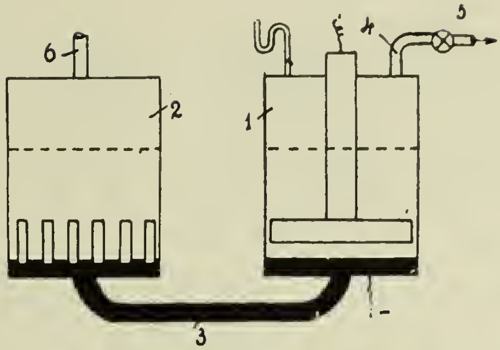

Fig. 1

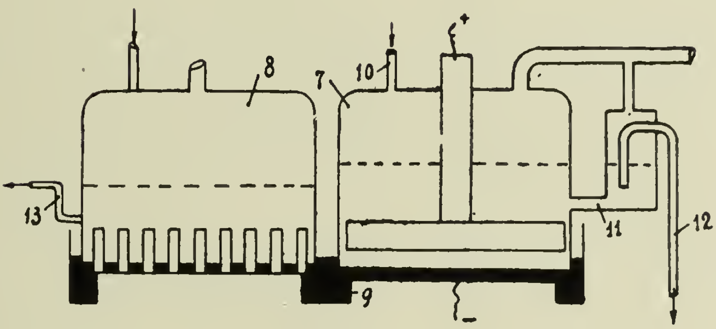

Fig. 2

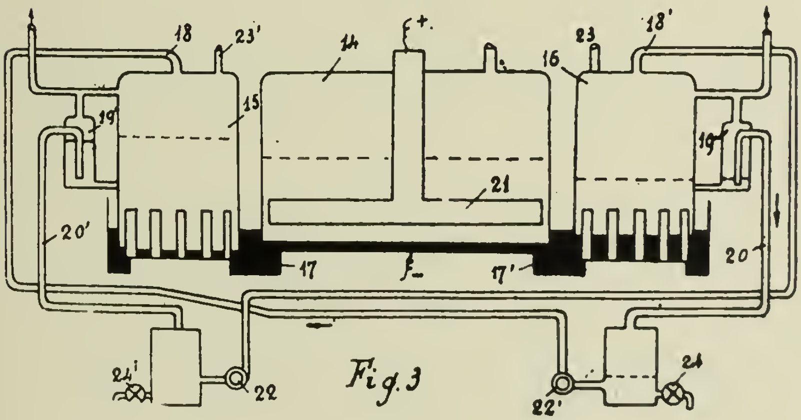

Fig. 3

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ALIEN PROPERTY CUSTODIAN

CONDENSERS

Werner Schmidt, Berlin, Germany; vested in the Alien Property Custodian

Application filed October 10, 1941

High power condensers, especially those used with high frequency transmitters, have in general a dielectric made of mica. Also, ceramic material of low losses has been employed as a dielectric. However, the known arrangements of condensers so constructed do not meet the requirements of practice.

Condensers are wanted which are comprised of component condensers or elements interconnected in series and adapted to be tapped selectively in accordance with the mode of operation of the transmitter. Further, the space requirements should be small in order to avoid, as far as possible, the necessity for varying the usual construction of the transmitters. The customary condensers with mica as a dielectric satisfy these requirements, while condensers comprising a ceramic dielectric do not so far.

According to the invention, the component condensers or elements comprise a ceramic disc which has an edge portion thicker than the central portion thereof, as will be understood from the following description and the accompanying drawing, in which

Fig. 1 shows an end view and a sectional view of a condenser element as provided by the invention, while Fig. 2 is a somewhat diagrammatic side view that represents a condenser composed of a number of such elements. Fig. 3 is a sectional detail view and illustrates a step of manufacture referred to hereafter. Figs. 1 and 3 are drawn to a scale larger than that of Fig. 2.

The condenser elements comprise ceramic discs **1** whose edge portion **2** is thicker than their central portion. The two end faces of **2** are ground at **3** to be plane and parallel to each other and are beveled toward a circumferential groove **4** of disc **1**. **5** denotes metal coatings on the end faces of the disc. The coatings **5** may consist of silver, for instance, applied to the disc by melting. The efficiency of such a condenser element **1**, **5** is mainly due to the thin central portion thereof. If, however, the condenser elements were constructed with the aid of ceramic plates as thin throughout as this central portion, that is, plates having no enlarged edge portion **2**, then it would be impossible to obtain condensers of sufficient mechanical strength and puncture strength, whereas the discs **1** here shown are not liable easily to break away since the edge portion **2** gives them a good mechanical strength.

The capacity value of the novel condensers may be varied by varying the thickness of the central portion of the discs **1**.

The groove **4** acts to enlarge the creeping distance or leakage path between the coatings **5**.

A number of condensers **1**, **5** combined as illustrated in Fig. 2 constitute a composite condenser whose elements **1**, **5** are held together by means of a clamping device or a casing not shown in the drawing and known per se.

Tape-shaped cooling vanes of copper or aluminium, for instance, or formed as copper-plated metal tapes, may be arranged between the elements **1**, **5**. These cooling vanes may also serve as electrical taps. As the cooling vanes are arranged to contact with the metal coatings **5** no precautions are necessary to provide for the requisite electrical connection between the elements **1**, **5**.

In the manufacture of such condenser elements these may happen not to be of the desired capacity value. The use of a balancing method will therefore be of advantage especially where the discs **1** are manufactured by moulding, for reasons of economy. The usual mode of balancing consists in removing part of the metal coating. In this way, however, the puncture strength and load capacity of the condenser elements is greatly decreased. Therefore, whenever the capacity value of a condenser element proves to be somewhat smaller than it should be, one feature of the invention consists in the following balancing method: disc **1** is ground out to be formed with a recess **7**, Fig. 3, or several such recesses, the wall thickness thus being diminished there. This grinding operation is effected in steps. After each step the recess formed in the disc is filled with a suitable conductive material, such as mercury, graphite or the like, whereupon a capacity test is made. When the desired capacity value has been attained in this way all conductive material is removed from disc **1**, which then is again metallized in a well-known manner.

WERNER SCHMIDT.

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W. SCHMIDT
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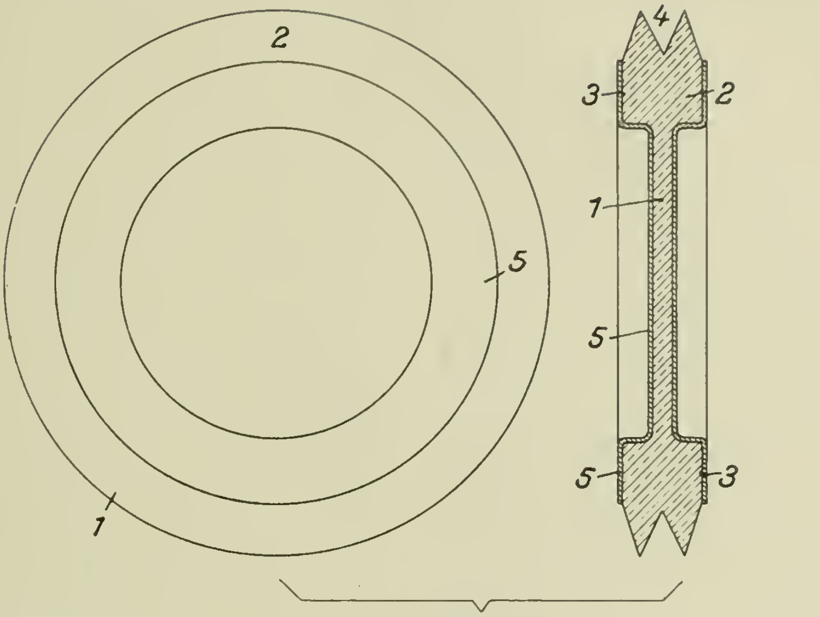

Fig.1

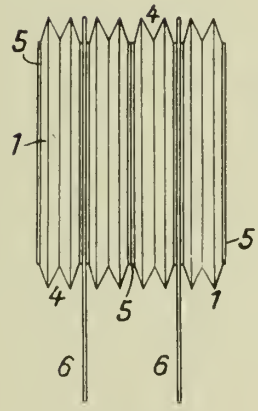

Fig.2

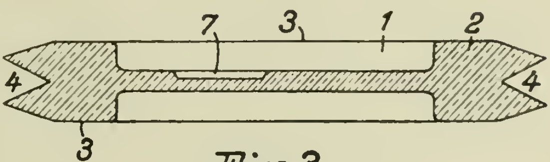

Fig.3

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ALIEN PROPERTY CUSTODIAN

FROTH FLOTATION

August Götte, Frankfurt/Main, Germany; vested in the Alien Property Custodian

No Drawing. Application filed October 14, 1941

The present invention relates to froth flotation of minerals like ores, coal or similar matter, during the separation of which one component of the conglomerate is prevented from getting into the concentrate by the addition of depressants. There are various known depressants, as e. g. zinc sulfate, cyanides of alcali or earth alcali metals, sulfites or sulphur dioxide for zinc sulfide minerals, calcium oxide for iron sulfide ores, sodium carbonate, sodium silicate, calcium oxide and iron cyanide for copper ores, bichromates, phosphates or arsenates for lead sulfide ores, citric acid, copper sulfate, lead nitrate or sodium silicate, sodium carbonate and monosodium-ortho-phosphate for quartz.

It is further known to use several depressants simultaneously. When working up, e. g., lead-sulfide-zincsulfide-ores the main components of which are galena and zinc blend, the former is separated by floating with xanthates in the presence of suitable frothers, whilst the zinc sulfide is depressed by the addition of sodium cyanide and zinc sulfate. The use of the mixture of several depressing agents is based on the fact that these depressants react with each other under the formation of reaction products which exert an especially strong depressing effect. In the example as above the two soluble compounds sodium cyanide and zinc sulfate are converted into soluble sodium sulfate and insoluble zinc cyanide. This zinc cyanide precipitates superficially at the zinc blend which is to be depressed, preventing this from getting into the concentrate.

According to the present invention it has been found that the separation of the compounds of the minerals to be floated with the help of cyanides of alcali or earth alcali metals as depressants together with one or more other depressants is much improved, if the two or more depressing agents are added not at the same time but one after the other.

According to my invention the cyanide is added to the pulp only after the flotation, for which sofar the other depressants have been employed, has advanced to such a degree that a considerable quantity of the concentrate has already separated. Preferably the cyanide is added when the concentrate is beginning to contain essential quantities of the components to be depressed.

When working up lead-zinc-sulfide ores by frothing, at the beginning of the flotation process zinc sulfate is added in order to depress zinc sulfide. During flotation the amount of zinc sulfide contained in the lead concentrate is observed. This contents having increased noticeably sodium cyanide is added and the flotation process is continued. Thus separation of the two components in a high percent concentrate and with excellent yields is guaranteed.

The new process is especially suitable for working up ores the separation of which is difficult, as e. g. lead-zinc-ores containing copper with a high content of zinc. A further advantage of my process consists in a considerable amount of flotation agents being saved. It hitherto being necessary to increase the depressing effect by a considerable increase in concentration of the depressants simultaneously used, according to the invention only smaller quantities of the depressants, which are to be employed successively, suffice to obtain the same effect. At the same time such high concentration of the depressants is avoided, as will cause as well depressing of the ore component to be floated out.

Furthermore I may first use a mixture of two or more depressants and afterwards a mixture of the same depressants, chosing, however, different proportions. In the first mixture the one depressant, in the second mixture the other depressant is predominant. Of course only such depressants are to be employed, which, by mutual reaction, do not become inactive.

Examples

1. A copper-lead-zinc-ore containing 16% lead, 13% zinc and 4.5% copper was ground to 0.1 mm and then suspended and floated with water in the ratio of one part solids to 4 parts liquid. The flotation was performed with potassium xanthate as collector for the galena and a mixture of pine oil and tar oil as frother. Zinc sulfate and sodium cyanide were added in order to depress the zinc blend. In one case the two depressants were added simultaneously, whereby a mixture of 4 kg zinc sulfate and 0.5 kg sodium cyanide per 1000 kg ore was used. In a second case the depressants were, according to my invention, added one after the other, viz. firstly 1.5 kg of zinc sulfate and afterwards 0.1 kg sodium cyanide.

The zinc concentration thus obtained in the first case contained 51.2% zinc and 9.5% lead, whilst in the second case, in which the depressants were added successively, in spite of the remarkably decreased quantities of the depressants the contents of the zinc concentrate increased up to 56.2% zinc and the contents of lead decreased to 4.5%. This excellent separation according to my invention requires only 0.14 kg potassium xanthate per 1000 kg ore, compared with 0.2 kg potassium xanthate which are re-

quired in case of the two depressants being added at once in the usual manner.

2. A zinc-copper-ore is wet ground to 200 mesh and then floated in usual manner, whereby 200 g zinc sulfate and 150 g. sodium cyanide per 1000 kg ores are added simultaneously as depressants for the zinc blend. At first a copper concentrate is floated out with the help of sodium-ethyl-xanthate and pine oil, whereupon, after the addition of copper sulfate for the reactivation of the zinc blend, a zinc concentrate is floated out. There are obtained, firstly a copper concentrate containing 20.13% copper and 10.7% zinc and secondly a zinc concentrate containing 43.8% zinc and 1.82% copper.

According to the invention in a second case the same pulp was floated by adding first 200 g zinc sulfate per 1000 kg ores, in order to depress the zinc blend, floating out a part of the copper concentrate, then—before the flotation of copper has been completed—adding 150 g sodium cyanide per 1000 kg ores, subsequently completing floating out of the copper and finally floating out the sulfide component, which has been reactivated by adding copper sulfate. The copper concentrate obtained by this improved proceeding assayed 21.4% copper—that is an increased contents of copper—and 8.6% zinc, that is an decreased content of zinc. Further there is obtained a zinc concentrate containing 46.7% zinc, that is an increased content of zinc—and 1.75% copper—that is a decreased content of copper.

3. An ore comprising the sulfides of lead and iron is floated, similarly to Example 2, with sodium ethyl xanthate and pine oil, 1.4 kg lime and 100 g sodium cyanide being employed as depressants for pyrite. In one case the depressants were added at the same time. In this case a lead concentrate was collected containing 72.54% lead and 4.21% iron, and a pyrite concentrate, containing 40.23% iron and 2.10% lead. When working according to the invention the depressants were added one after the other. The lead concentrate contained 73.61% lead, that is more lead, and 2.82% iron, that is less iron, whilst the pyrite concentrate contained 42.40% iron, that is more iron, and 2.07% lead, that is less lead, compared with the first case.

AUGUST GÖTTE

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ALIEN PROPERTY CUSTODIAN

CIRCUIT BREAKER FLUID PRESSURE OPERATED SYSTEM

Hans Stegelitz, Berlin-Johannisthal and Wilhelm Schreiner, Berlin-Niederschonhausen, Germany; vested in the Alien Property Custodian

Application filed October 16, 1941

Our invention relates to circuit breaker fluid pressure operated mechanisms, such as, for example, pneumatically actuated mechanisms for operating the contacts of an electric circuit breaker between open and closed circuit positions.

It has been recognized that the operating mechanism for closing a large capacity electric circuit breaker, for example, should include a so-called "seal" for automatically insuring continuation of the operating impulse throughout substantially the entire closing stroke of the breaker, and for discontinuing the impulse substantially at that point. Burning of the breaker contacts due to incomplete closure is therefore precluded and the usual trip-free feature assures short circuit protection. Methods heretofore used have generally included electric relays and auxiliary circuits which have not always worked satisfactorily and which often complicate the operating mechanism.

The principal object of our invention is the provision of an improved fluid-operated mechanism of the piston type for electric circuit breakers wherein the opening and closing control valves for admitting fluid pressure to the actuating piston are provided with interlocking means for rendering inoperative means for opening the closing valve when the opening valve is operated and for providing trip-free operation of said circuit breaker.

Our invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

This application is a continuation of our application Serial No. 192,804, filed Feburary 26, 1938 for "Fluid Pressure Operated Mechanism."

Referring to the drawing Fig. 1 is a partly diagrammatic layout of a pneumatically operated mechanism for actuating an electric circuit breaker in accordance with the present invention, Fig. 1*a* is a similar view illustrating the mechanism at the end of the closing stroke and Fig. 2 is a similar view illustrating a modification of the pneumatic seal for carrying through the actuating impulse.

The pneumatic system illustrated by Fig. 1 comprises a suitable source of fluid pressure, such as a conduit **1** connected to a gas reservoir (not shown), circuit breaker means adapted to be actuated by fluid pressure, such as a double-acting piston generally indicated at **2**, and a main valve **3** for controlling the fluid connection **4** between the source and the actuating piston structure.

As shown the piston structure **2** comprises a pair of pistons **5** and **6** rigidly interconnected at **7** for reciprocal operation within the cylinder portions **5'** and **6'** respectively. The piston structure is operatively connected in any suitable manner such as by a link **8** and pin **9** to the movable contact structure **10** of an electric circuit breaker. The circuit breaker may be of any suitable type and in the present case wherein a source of gas pressure is available, the gas blast type may advantageously be used. As shown, the circuit breaker is in the open position, the contact **10** being elevated during the closing operation to engage the fixed contact structure at **11**. In the arrangement so far described it will be apparent that opening of the main valve **3** admits fluid pressure by way of the connection **4** to the lower piston **5** so as to close the breaker.

For the purpose of "sealing" this operating impulse an auxiliary pressure responsive device **12** is disposed in communication with the fluid connection **4** and is operatively related to the valve **3** through a suitable mechanical connection for holding the valve open. Likewise, a second auxiliary pressure responsive device **13** adapted to be placed in communication with the connection **4** after predetermined movement of the piston **5** is located with respect to the aforesaid mechanical connection so as to render the same inoperative and permit closing of the valve **3** when the circuit breaker has substantially completed its closing stroke.

To this end the pressure responsive device **12** comprises a piston **12'** directly in communication with the fluid pressure connection **4** and operatively connected through a bell-crank **14** and toggle linkage **15** to the main valve stem **16**. The pressure responsive device **13** likewise includes a piston **13'** having an extension **13''** for engaging the knee **15'** of the toggle and serving as a support for holding the same in thrust-transmitting position.

It will therefore be apparent that when the valve **3** is initially opened in response to any suitable operation or impulse, such as by manual operation at **14'**, or by suitable and well-known remote control means, the fluid pressure in connection **4** operates simultaneously the pistons **5** and **12'**. As the piston **5** moves upward to close the breaker the piston **12'** through toggle linkage **15** forces the valve stem **16** toward the open position and holds it in that position as long as the piston **12'**

is under fluid pressure and the toggle 15 is in the thrust-transmitting position. When, however, the closing stroke is substantially completed as shown by Fig. 1*a* the piston 5 uncovers the port in the cylinder 5′ communicating with the conduit 17 for admitting pressure to the piston 13′. This causes upward or buckling movement of the toggle knee 15 and subsequent collapse of the toggle thereby rendering the pressure responsive device 12 inoperative with respect to the main valve 3 and permitting closing of the valve under influence of the conduit pressure or other suitable biasing means.

The pneumatic operating means above described therefore is effective to seal a pneumatic actuating impulse, once initiated, through a predetermined operation, and automatically to discontinue the impulse upon completion of the operation.

The means for opening the breaker, although shown as pneumatically operated, can obviously be selected in accordance with the particular breaker requirements. For example, the breaker can be opened by the usual compression spring that is unlatched in response to a tripping impulse. In the pneumatically operated means shown the upper or opening piston 6 is also adapted to be in communication with the pressure source 1 through a fluid connection 20 controlled by a valve 21. In this case opening of the valve 21 causes downward movement of the piston structure and opening of the breaker.

For the purpose of carrying through the actuating impulse in the manner above described, the valve 21 has also associated therewith fluid pressure responsive devices 22 and 23 similar to the devices 12 and 13 respectively. The operating piston of the device 22 is in communication with the fluid connection 20 and the piston of the device 23 is in communication with the cylinder 6′ for receiving a delayed pressure impulse in the manner above described. The device 22 coacts with the bell-crank 24 which is in turn adapted to be operatively connected to the valve stem 21 through a thrust transmitting toggle 25. The toggle 25 in the reset position shown is spaced from the valve stem 21′ for a reason presently described.

For the purpose of interlocking the closing and opening operations so that the breaker cannot be inadvertently closed after the opening operation has been initiated there is provided a mechanical connection 26 between the bell-crank lever 24 and the toggle 15. Accordingly, when the bell-crank lever 24 is rotated clockwise in response to an initial impulse and admission of fluid pressure to the opening piston 6, the knee 15′ of the toggle 15 is raised to the collapsed position so that an actuating impulse cannot be transmitted to the valve 3. When, however, the breaker is opened and the mechanism in the position shown, buckling of the toggle 15 at the end of the closing stroke is not sufficient to cause opening of the valve 21 by reason of the lost motion between the toggle 25 and the valve stem 21′.

The opening operation may be initiated, either manually as at 24′ or by suitable remote control means such as an auxiliary pressure line 27 having a one-way valve 28 relating to the fluid connection 20. It will be apparent that when the remote control means is operated to admit gas under pressure to the line 27, the device 22 will be operated to open the valve 21 in the manner previously described. At the same time, the rod 26 will be lifted, causing collapse of the toggle 15 and closing of the valve 3. Thus, even though the piston 5 may not have reached the end of its closing stroke, actuation of the remote control means can be effective to cause premature reversal of the piston from an intermediate point in the closing stroke.

It will be noted that a fluid-operated mechanism as described permits trip-free operation of the breaker during closing by reason of the collapsible connection to the closing valve 3, and also prevents "pumping" or repeated reclosures of the breaker in addition to the interlocking feature above described. By trip-free operation is meant instantaneous release of the actuated means permiting it to return to its original position notwithstanding the fact that the closing operation is incomplete. This is accomplished by collapsing the toggle 15 thereby permitting valve 3 to close. The compressed gas acting on piston 5 is thus cut off and the piston cylinder simultaneously vented to atmosphere through pipe 4 as shown by Fig. 1*a*.

In the modification shown by Fig. 2 a time-delay device is used in lieu of the piston controlled connection for automatically effecting closure of the main valve. In this case the valve 3 controlling communication between the source 1 and fluid connection 4 is adapted to be actuated by a lever 30 having suitable actuating means, such as, for example a push button shown at 31. The lever 30 can be adjustably related to the valve stem 16 as at 32.

For the purpose of sealing the valve 3 after operation of the push button, a differential piston having two portions 33 and 34 is connected as at 35 to the lever 30. The differential piston operates within a housing 36, one end of which forms a cylinder for the piston portion 33 connected at 37 with the main fluid connection 4. The other part of the housing forms a cylinder for the large piston 34, that is adapted to be in communication at 38 with the connection 4 through a time-delay device 39. The device 39 may comprise simply a fluid reservoir, the entrance of which at 40 can be suitably restricted in combination with an adjustable escape at 41, so that fluid pressure builds up in the cylinder of piston 34 only after a predetermined time.

The operation of this device is believed to be apparent from the above description, the first opening of the valve 3 transmitting pressure to the first fluid responsive device at 33 for sealing open the valve 3, and the large portion 34 of the differential piston, or the second fluid responsive device, serving after a predetermined time to return the lever to its initial position thereby permitting closing of the valve 3 under bias of the spring at 31.

It should be understood that our invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of our invention.

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CIRCUIT BREAKER FLUID PRESSURE OPERATED SYSTEM

Filed Oct. 16, 1941

Serial No. 415,288

2 Sheets-Sheet 1

Fig. 1.

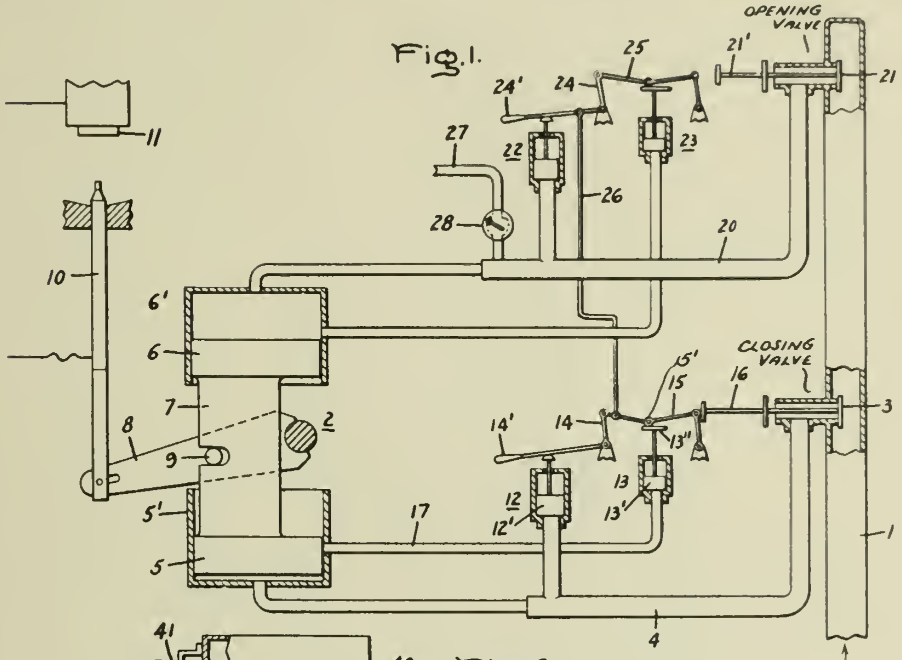
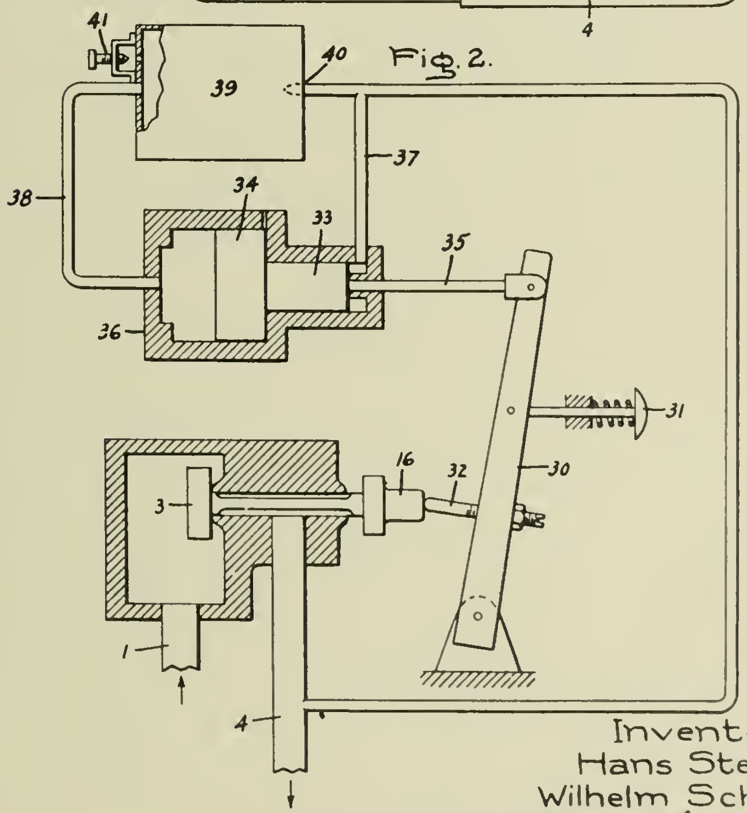


Fig. 2.



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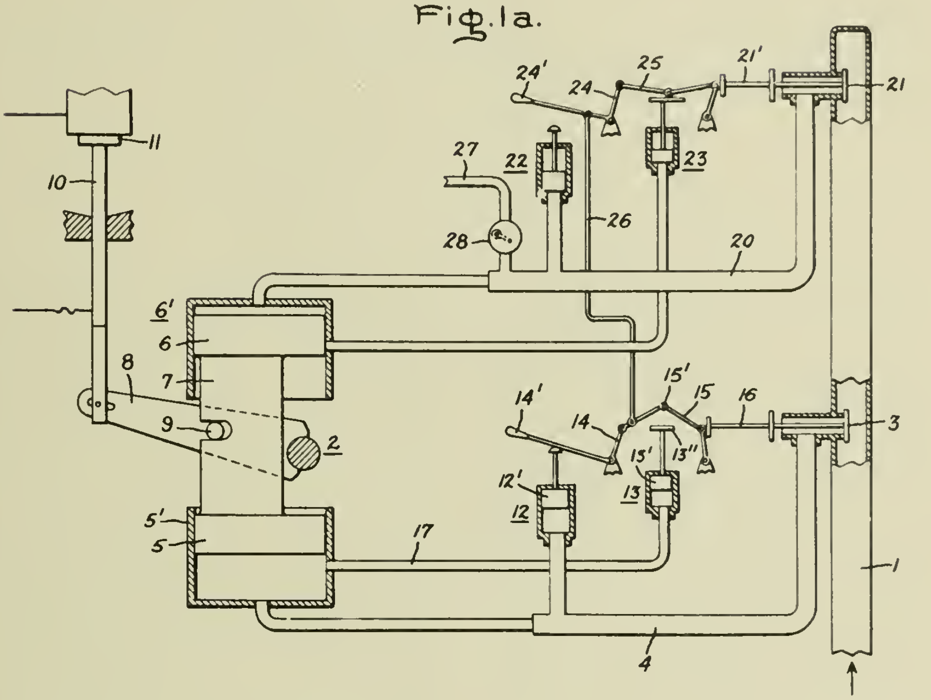
2 Sheets-Sheet 2

Fig.1a.



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ALIEN PROPERTY CUSTODIAN

RECOVERY OF HYDROCARBONS FROM CHLORINATION WASTE GASES OF HYDROCARBONS

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No Drawing. Application filed October 28, 1941

The present invention relates to a process for the recovery of hydrocarbons from waste gases in the chlorination of hydrocarbons.

It is known that during the chlorination process of hydrocarbons considerable quantities of the latter escape from the chlorination apparatus together with the waste gases consisting mainly of hydrochloric acid. The hydrochloric acid recovered is thereby contaminated and in addition the chlorination process is rendered less economical by the loss of hydrocarbons.

In the known processes the hydrocarbons contained in the chlorination waste gases are washed out with water simultaneously with the hydrochloric gas leaving the apparatus, thereupon being separated in a known manner from the resulting aqueous hydrochloric acid solution. However, a considerable loss of hydrocarbons cannot be avoided by such an operation method and besides it is not possible in this way to liquefy the hydrochloric gas directly, if desired.

According to the present invention, the hydrocarbons are separated from the chlorination waste gases prior to the absorption or liquefaction of the hydrochloric acid by washing them with an inert organic solvent. Suitable organic solvents may be used such as chlorinated hydrocarbons, especially those which are formed in the course of the chlorination process. Any hydrocarbon absorbed by the washing agent used can be separated from the latter in any known manner, for instance by fractionated distillation.

Particularly good results as regard a complete washing can be obtained according to the present invention, if the washing agent employed is cooled until the dew point of the hydrocarbons to be washed out of the chlorination gases is reached.

Example.—The waste gases containing hydrochloric acid and benzene obtained during the chlorination process of benzene into monochlorbenzene were washed with monochlorbenzene that had been cooled to $-20°$ C. The amount of benzene contained in said waste gases could be recovered almost quantitively by fractionated distillation of the washing liquid and the remaining hydrochloric acid gas was recovered in a substantially purified condition. The yield of washed benzene amounted to 67 parts by weight based on 1000 parts by weight of the initial material. The total loss of benzene as calculated from the quantity of the resulting monochlorbenzene, of the nonchlorinated benzene and of the benzene that had been recovered from the waste gases could be reduced in this manner to the exceedingly low percentages of 0,5%.

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ALIEN PROPERTY CUSTODIAN

ELECTRIC CONTROL CIRCUITS

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Application filed October 20, 1941

My invention relates to electric control circuits and more particularly to electric control circuits for controlling the operation of electric valve translating apparatus for energizing the windings of a dynamo-electric machine.

This application is a continuation-in-part of my application Serial No. 388,913, filed April 16, 1941, and assigned to the same assignee as the present invention.

In control circuits for controlling the operation of dynamo-electric machines energized through electrical valve converting apparatus it is often necessary to provide a source of control voltage having a periodicity corresponding to the speed of rotation of the machine if it is of the synchronous type, or corresponding to slip frequency if the dynamo-electric machine is of the asynchronous type. Many arrangements have been devised in the past for producing control impulses of this character. These arrangements include mechanical distributors, magnetic distributors and photo-electric devices. All of these arrangements have been subject to some difficulties from the standpoint of moving parts, electrical connections, or the ability to produce suitable control impulses under variable speed operation. For example, with the asynchronous type of machine it has been difficult to provide simple and reliable control means which function to produce a control voltage of desired magnitude and frequency at zero speed and at speeds approaching synchronism. In accordance with the teachings of my invention I provide an improved control circuit for producing control impulses of the desired frequency for controlling the operation of an electric valve translating apparatus connected to control the energization of the windings of a dynamo-electric machine which is readily applicable to both synchronous and asynchronous machines and which produces a reliable control under widely varying speeds of operation and which is simple and economical to produce.

It is an object of my invention to provide a new and improved electric control system.

It is another object of my invention to provide a new and improved electric control circuit for controlling the conductivities of electric valve means which are connected to control the sequential energization of the windings of a dynamo-electric machine.

It is a still further object of my invention to provide a new and improved electric control circuit employing electrical control for producing control impulses of motor frequency or slip frequency for synchronous and asynchronous dynamo-electric machines, respectively, which is characterized by its simplicity and reliable operation over widely varying operating conditions.

My invention will be better understood by reference to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims. In the drawing, Fig. 1 is a schematic representation of my invention applied to a control circuit for an electric valve translating apparatus connected to energize the stator winding of a synchronous type dynamo-electric machine; Fig. 2 is a view of a detail of Fig. 1; Fig. 3 illustrates schematically the system of Fig. 1 as applied to an asynchronous type dynamo-electric machine and with a suitable amplifier and excitation network for energizing the control electrodes in accordance with the impulses produced by operation of the cathode ray tube.

Referring now to Fig. 1 of the drawing, I have shown my invention embodied in an electric valve translating system and control circuit therefor for energizing the windings of a dynamo-electric machine illustrated generally by the numeral **10** from a polyphase alternating current circuit **11**. The dynamo-electric machine of Fig. 1 is a motor of the synchronous type having stator windings **12** including phase windings **13**, **14** and **15** and a field winding **16** wound on a suitable rotatable magnetic structure **17** and energized from a suitable source of direct current (not shown). If desired, the direct current may be derived from the alternating current circuit **11** by means of suitable rectifying apparatus. The stator windings **12** are connected to be sequentially energized from the alternating current circuit **11** by means of electric translating apparatus including a supply transformer **18** and electric valve means **19**. The transformer as illustrated comprises a mesh connected three-phase primary winding **20** and six secondary winding sections **21** to **26**, inclusive, two of the winding sections being electromagnetically associated with each of the phases of the primary network **20**. The windings **12** to **14** of the electric motor and the windings **21** to **26** of the transformer **17** are each provided with an intermediate terminal and end terminals. The intermediate terminals of the transformer windings **21** to **26** are connected with the end terminals of the windings **12** to **14** of the stator while the end terminals of the windings **21** to **26** are connected respectively to the anodes **27** to **38** of the electric valve means **19**. The valve means **19** may be of any suitable type and as illustrated

comprises a container having a mercury pool type cathode 39 and control members or grids 40 associated with each of the anodes 27 to 38, inclusive. The valve means preferably is of the type employing an ionizable medium such as a gas or vapor capable of supporting an arc discharge. The intermediate terminals of the stator windings 12 to 14, inclusive, are connected to the cathode 39 through the phase windings of a polyphase interphase transformer or phase equalizing inductive reactance device 41 having the neutral terminal thereof connected to cathode 39 through a smoothing reactor 42.

From a consideration of the above description in connection with Fig. 1, it is clear that the electric valve means 19 provides six groups of discharge paths with each group acting as a full wave rectifier with respect to the alternating current circuit 11 to control the flow of unidirectional current through one-half of each of the windings 12 to 14, inclusive, of the dynamo-electric machine 11. In accordance with my invention I provide an improved control circuit for controlling the energization of the control members 40 associated with the anodes 27 to 38, respectively, to render the pairs of anodes conductive sequentially and in this way sequentially energize the stator windings 12 of the machine 10 to produce a rotating electromagnetic field which interacts with the field produced by the rotor windings 15 to produce torque on the rotor of the machine. In order to control the conductivities of the discharge paths of the electric valve means 19 in accordance with the position of the rotor strucure 17 of the motor, I provide a novel control apparatus including electronic means in the form of a cathode ray tube mounted in fixed relation in space and in alignment with the motor shaft on which is mounted a suitable electromagnetic or permanent magnet means 43 having the pole pieces thereof cooperating with the cathode ray device to deflect the electron beam in accordance with the position of the rotor. Cathode ray tubes suitable for this application may be readily obtained and in the schematic arrangement illustrated the tube comprises a cathode or electron gun 44, an anode or accelerating electrode 45 and six collector plates 46 to 51, inclusive, arranged in circumferentially spaced and insulated relation at the end of the cathode ray tube. Each of the collector plates is connected to the cathode 44 of the tube through a common source of unidirectional voltage such as a battery 52 and individual resistors 53 to 58, inclusive. Only two of the resistors, namely, 53 and 56, have been shown in Fig. 1. As the magnetic structure 43 is rotated by the rotation of the motor rotor the electron beam is deflected from one of the collector plates to another and in this way a voltage appears successively across resistors 53 to 58, inclusive, at a periodicity depending upon the speed of rotation of the motor. It will be noted that the magnitude of the voltages across resistors 53 to 58 is determined by the circuit of the cathode ray tube and is independent of the speed of rotation of the motor rotor which simply determines the duration of each of the current or voltage impulses. It will be noted that the voltage across resistors 53 to 58 will be positive at the common terminal which is connected to the cathode of the cathode ray tube through battery 52 with respect to the separate terminals of these resistors. These voltage impulses may be applied to the control members 40 of electric valve means by any suitable excitation circuit 59, preferably through an amplifier 60 which is utilized to increase the power available from the cathode ray tube circuit.

An excitation voltage having the frequency of the alternating current circuit 11 may also be impressed on the excitation network 59 by means of a suitable phase shifting device 61 energized from the alternating current circuit 11 and having the output thereof impressed on the excitation network 59 through a suitable amplifier 62.

Before considering the operation of the circuit illustrated in Fig. 1 in detail the embodiment illustrated in Fig. 3 will be described. In Fig. 3 the present invention is shown in a system for controlling the transfer of energy between an alternating current circuit and the induced winding of an asynchronous type dynamo-electric machine. In Fig. 3 the excitation network and amplifiers referred to in Fig. 1 have been shown in more detail. In the arrangement shown in Fig. 3 the same reference numerals as used in Fig. 1 have been employed to designate corresponding parts.

Referring now to Fig. 3, the stator windings 13, 14 and 15 of an asynchronous type dynamo-electric machine 10 are connected with the alternating current circuit 11 through electric valve means 19 and transformer 18. The rotor winding of the asynchronous machine 10 comprises a three-phase mesh-connected network 63 having the terminals thereof connected to the slip rings 64 which are in turn electrically connected to the alternating current circuit 11 by means of conductors 65. In order to control the deflection of the electron beam of the electron tube I provide a polyphase electromagnetic structure 66 having a three-phase wye-connected winding 67 wound on the poles 68. The end terminals of the winding 67 are connected with the slip rings 64. The magnetic structure 66 is connected to rotate with the rotor of the dynamo-electric machine by a suitable mechanical connection (not shown). The windings of the electromagnet 66 are connected to produce an electromagnetic field rotating at the frequency of the alternating current circuit 11 and in the opposite direction with respect to the mechanical rotation of the rotor 63. In this way the beam of the electron tube is deflected at the difference between rotor speed and the frequency of the alternating current circuit 11 or, in other words, the beam is deflected at the slip frequency of the dynamo-electric machine. With this arrangement the voltage impulses appearing across the resistors 53 to 58, inclusive, have a duration corresponding to slip frequency.

The amplifier and excitation networks employed for controlling the energization of the control members 40 of the electric valve means in accordance with the voltage impulses appearing across resistors 53 to 58 will now be described. In order to amplify the control voltages appearing across resistors 53 to 58 I provide an amplifier 60, preferably employing electric valves 69 to 74 which, as illustrated, are of the three-element, high vacuum type and have the cathodes thereof connected to the common terminal of the resistors 53 to 58, and the control members connected respectively to the other terminals of the resistors 53 to 58. The anodes of the valves 69 and 70 are connected together through resistors 75 and 76 having an intermediate terminal 77 connected to the cathodes

of the valves 69 and 70 through a suitable source of direct current voltage illustrated as comprising a battery 78. The remainder of the amplifier valves 71, 72, and 73, 74 are arranged in groups and are similarly connected to produce output voltages across resistors 79, 80, 81 and 82.

The voltages appearing across resistors 76 to 82, inclusive, are of 60 electrical degrees duration with the electron tube having six collectors as illustrated. These may be used directly to control the conductivities of the electric discharge valves if it is desired to energize one winding at a time in sequence. However, it may be desirable to arrange the excitation system to energize a plurality of windings simultaneously and to change the windings which are energized sequentially at intervals corresponding to 60 electrical degrees. In the arrangement illustrated this is accomplished by controlling the valves of an inverter circuit in accordance with the voltage impulses appearing across the resistors 75 and 76, and intermediate terminals 77 and 79 to 82, inclusive.

Referring now to the drawing, the inverter circuit comprises six electric valves 83 to 88, inclusive, each preferably being of the type utilizing a gas or vapor and comprising an anode, a cathode and a control member. The valves are arranged in three groups of two each and are connected to form three inverters of the parallel type. The cathodes are connected together and to the negative lead of a direct current supply 89 and the anodes of each pair are connected together through resistances 90, 91; 92, 93; and 94, 95. The midpoints of the pairs of resistors are connected to the cathode 39 of the electric valve means. A suitable commutating capacitor 96 is connected between the anodes of each pair of valves forming an inverter. The midterminals of the pairs of resistors associated with each pair of electric valves are also connected to the positive lead 97 of the direct current source.

It may be desirable also to control the discharge paths formed by the anodes 27 to 38, inclusive, and the cooperating cathode 39 in accordance with the frequency of the circuit 11. This may be accomplished by a suitable phase multiplying circuit for producing six-phase voltages at the frequency of the supply circuit 11. In the arrangement illustrated this is accomplished by a phase-shifting device 61 and a suitable amplifying arrangement illustrated generally by the numeral 62 which may comprise parallel inverters similar to those just described and energized from the direct current supply leads 89 and 97. The inverter will not be described in detail but comprises in general the electric valves 98 to 103, output transformers 104, 105 and 106 and the commutating capacitors 107. The control members of the electric valves are controlled in accordance with the output voltages of the phase shifting device 61. The output transformers 104 to 106, inclusive, each comprise a pair of center tapped secondary windings 108 and 109. The secondary windings 108 and 109 of the transformer 106 are shown with the midtaps thereof connected with the end terminals of the resistors 90 and 91 respectively and with the end terminals thereof connected to the control members associated with the anodes 27, 28, 29 and 30, respectively. It will be understood that the remainder of the transformer secondaries and the terminals of the resistors 92 to 95 are connected to energize the control members 40 associated with the remaining anodes 30 to 38 of the electric valve means 19.

A brief consideration of the operation of the arrangement shown in Fig. 3 will serve to bring out the features and advantages of my invention. From the description which has preceded, it is apparent that the electron beam of the electron or cathode ray tubes is deflected at slip frequency in a circular path and contacts the collector plates 46 to 51 in succession at intervals corresponding to 60 electrical degrees of slip frequency. As previously pointed out, this produces voltages across the resistors 53 to 58 which are positive at the common terminals thereof with respect to the individual terminals thereof. This means that the voltages impressed on the control members of the amplifier valves 69 to 74, inclusive, become negative at the time that the electron beam falls on the corresponding collector plate. For example, when the electron beam falls on the collector plate 46 the voltage across resistor 53 becomes negative and renders valve 69 nonconductive. This causes the voltage appearing across resistor 75 to disappear. It will be noted that the polarity of the voltage across resistor 75 is negative and when it disappears valve 83 becomes conductive. As the electron beam leaves the collector plate 46 the valve 83 does not become nonconductive at once, however, since the valve is energized from a direct current source and valve 84, which is the other valve of the parallel inverter, is not rendered conductive until 180 electrical degrees later when the electron beam falls on the collector plate 49. In this way a negative voltage appears across resistor 90 for a period of 180 electrical degrees of slip frequency.

From the foregoing description it is seen that as the beam progresses from one collector plate to another one electric valve of each of the inverter circuits comprising the valves 83, 84; 85, 86; and 87, 88 is rendered conductive and remains conductive for 180 electrical degrees of slip frequency at which time the other valve of that group is rendered conductive by the electron beam falling on the collector plate by which the particular valve is controlled. In this way the voltages across resistors 90, 91; 92, 93; and 94, 95 provide three single-phase rectangular waves of voltage of slip frequency and are impressed on the control members of the electric valves to render the discharge paths conductive in proper sequence to transfer energy between the circuit 11 and the stator winding 12 at slip frequency. Thus valve 83 starts conducting when the beam strikes collector plate 46 and remains conducting until 180 electrical degrees later when valve 84 is rendered conductive in response to the beam falling upon collector plate 49. The voltage impressed on the control members associated with anodes 27 and 28 is negative when valve 83 is conducting and in this way the half of winding 13 energized by current conducted through anodes 27 and 28 is deenergized for the 180 electrical degrees of slip frequency during which the beam travels from collector plate 46 to collector plate 49. The resistors 92 to 95 are connected in circuit with the control members 40 associated with the remaining anodes and the transformer windings 22 to 26 are connected with the motor windings in such a way that three winding sections of the windings 13, 14 and 15 which are electrically displaced 60 degrees at slip frequency with respect to each other are simultaneously energized. As the electron beam falls upon the next

collector plate the winding which trails electrically is deenergized and the next winding in a leading direction is rendered conducting. It is, of course, possible to utilize the impulses produced across resistors 53 to 58 more directly simply by amplifying them and utilizing these impulses to control the energization of the control members. In this event only one winding section would be energized at a time. However, the present arrangement provides for a better utilization of the windings of the dynamo-electric machine.

The excitation at the frequency of the circuit 11 is added to the slip frequency control voltage by means of the transformer winding. As is well understood by those skilled in the art when the asynchronous machine is operating below the frequency of the circuit 11 as an induction motor, energy is supplied to the stator winding through the valve means to the circuit 11. At this time the slip frequency excitation is rectifier excitation while the excitation at the frequency of the circuit 11 is inverter excitation. The proper phase relation of these excitation voltages may be provided by adjustment of the phase-shifting device 61 and by mechanical rotation of the electron tube. Similarly, when the machine is operating at a speed corresponding to a frequency above that of the circuit 11, energy is supplied to the winding 12 through the electric valve means and in this case the slip frequency excitation is the inverter excitation and the excitation at the frequency of the circuit 11 is the rectifier excitation. It is apparent from the foregoing description that the arrangement, according to the present invention, provides a system for providing slip frequency excitation in which the rectangular waves of slip frequency voltage are of a magnitude which is independent of the speed at which the machine is operating. The machine also requires a minimum of mechanical equipment and is characterized by reliable operation under widely varying operating conditions.

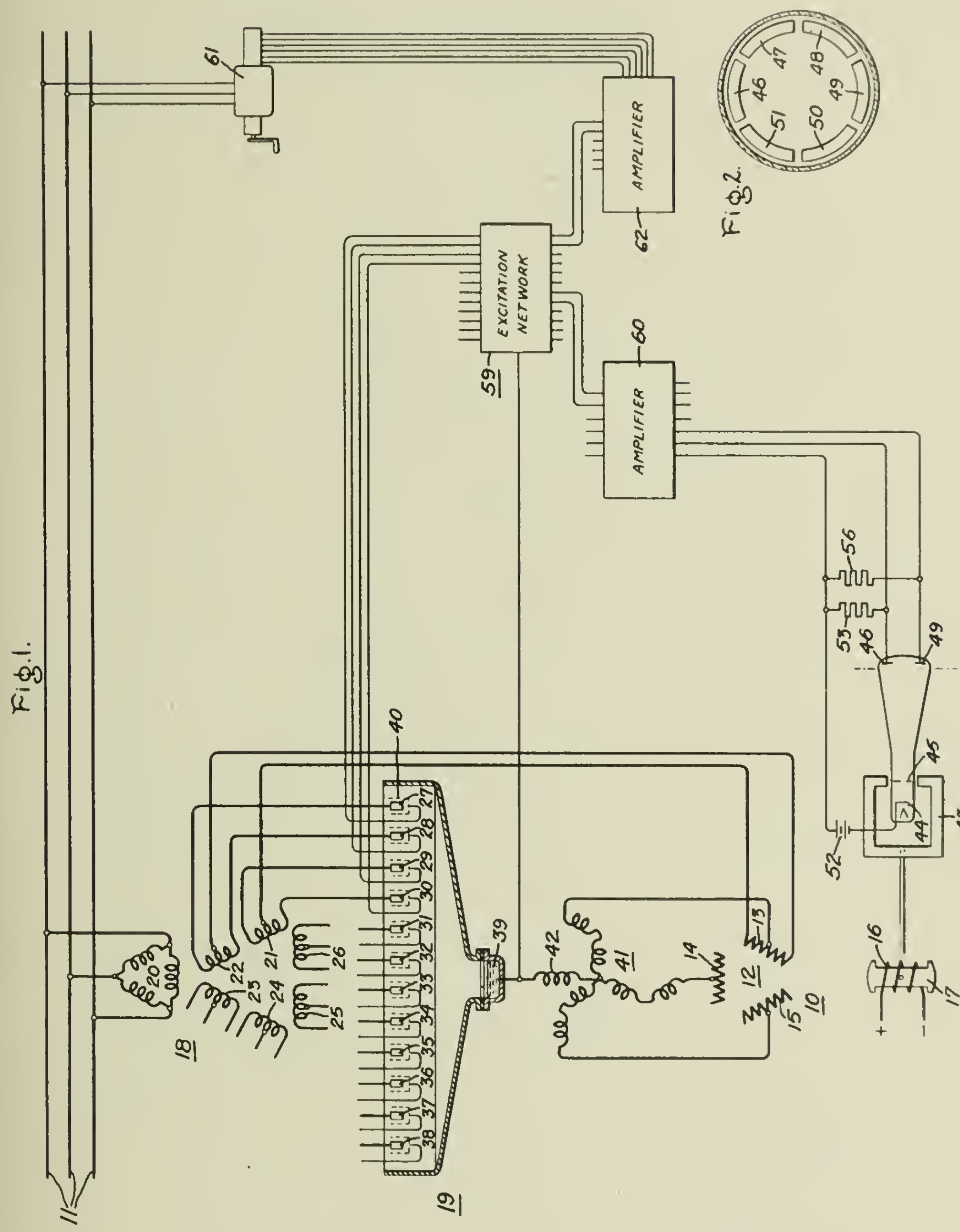
It is to be understood that the amplifier and excitation network employed in connection with Fig. 3 may be substituted for the amplifiers and excitation network illustrated schematically in connection with Fig. 1. In the operation of the system of Fig. 1, however, the control voltages are of rotational frequency as is well understood by those skilled in the art.

FRIEDRICH HÖLTERS.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

F. HÖLTERS
ELECTRIC CONTROL CIRCUITS
Filed Oct. 20, 1941

Serial No.
415,827
2 Sheets-Sheet 1



Inventor:
Friedrich Hölters,
by Harry E. Dunham
His Attorney.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

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ELECTRIC CONTROL CIRCUITS
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Serial No.
415,827
2 Sheets-Sheet 2

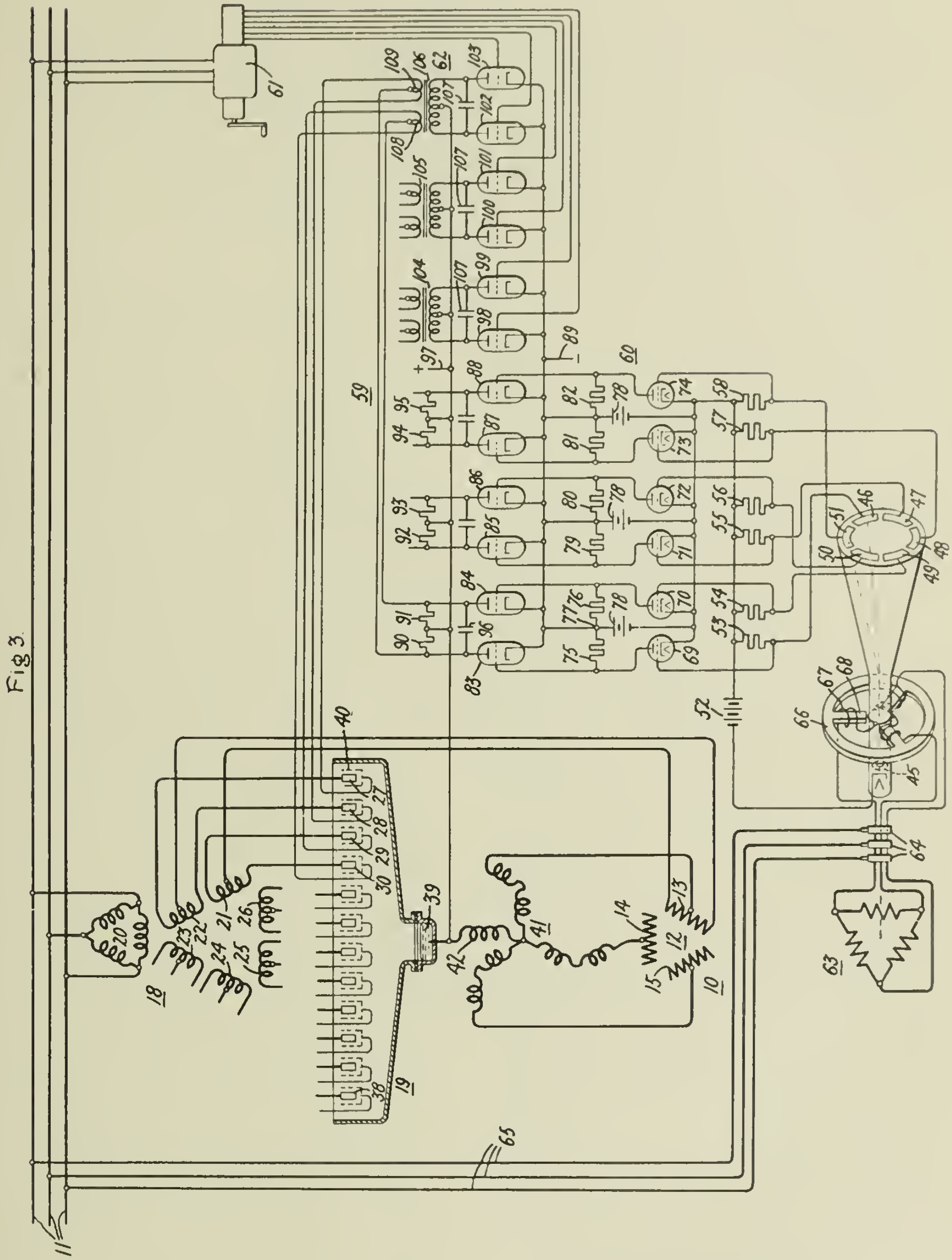

Fig. 3

Inventor:
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Published May 18, 1943

Serial No. 417,210

ALIEN PROPERTY CUSTODIAN

PERMANENT MAGNETS

Walter Dannöhl and Hans Neumann, Berlin-Siemensstadt, Germany; vested in the Alien Property Custodian

No Drawing. Application filed October 30, 1941

The invention relates to alloys for permanent magnets and is a continuation-in-part of the copending application Serial No. 237,957, filed October 31, 1938.

As stated in the application Serial No. 111,252, filed November 17, 1936, now patent No. 2,170,047, permanent magnets of a coercive force above 100 oersted and a remanence above 1000 gauss and distinguished by high tensile strength and good working properties, can be obtained with copper base alloys with nickel and cobalt, containing iron, if any, as a mere auxiliary ingredient of relatively low percentage. The limits for the main constituents of these alloys is 5 to 70% cobalt, 10 to 50% nickel and 20 to 85% copper. Iron may be present in amounts below 30%, preferably below 10%. Other auxiliary metals such as manganese or metals of the chromium group may also be admixed in minor quantities, preferably not exceeding a total of about 5%.

According to the present invention, permanent magnet alloys of the above-mentioned type are improved by adding thereto silver in an amount not over 10%. According to the further invention, if the alloy, besides copper and metals of the iron group, contains other metallic ingredients such as manganese, aluminum or chromium, the total amount of silver plus such other metals should not exceed about 10%. For instance, if the alloy contains copper and metals of the iron group within the above-stated percentile limits and also an addition of manganese and silver, the total amount of silver plus manganese should not be higher than about 10% to obtain optimum results. The invention permits increasing the magnetic qualities of the alloys, in particular as manifested by the magnetic power contents or the product of coercive force and remanence. The invention is also favorable in uses where an increased coercive force is desired without undue lowering of the remanence or vice versa. It is well known that an increase in coercive force or remanence can be obtained in most permanent magnet alloys by merely modifying the heat treatment. However, an increase in coercive force thus obtained incurs a considerable reduction in remanence, and vice versa, thus impairing the magnetic power of the magnet as compared with the optimum power content. In contrast thereto, the silver-containing alloys according to the invention permit increasing the coercive force or remanence without impairment to the magnetic power, and even, as mentioned, permit increasing the power content, and in many cases afford an increase in both the coercive force and remanence.

The numerical values of coercive force and remanence are, of course, not only dependent on the presence and percentage of the silver addition, but also on the composition of the copper base alloy and on the heat treatment. However, the presence of silver has the effect of increasing the potential power factor as compared with an otherwise similar composition not containing silver. In particular, it is favorable to replace part of the nickel content of the base alloy by silver within the limits above specified.

The invention is preferably carried out with alloys containing 15 to 65% cobalt, 15 to 35% nickel and 20 to 65% copper, with or without auxiliary additions. Especially favorable results are obtained with alloys consisting substantially of 25 to 45% cobalt, 20 to 35% nickel, 1 to 6%, preferably 3 to 5% silver, remainder copper with or without auxiliaries as above mentioned and usually containing customary impurities.

The effect of the silver ingredient will be apparent from the following comparative examples of alloys, all produced and treated under similar conditions.

An alloy composed of 30% cobalt, 30% nickel and 40% copper after being heat-treated as described below and upon magnetization exhibits a coercive force of H_c=520 oersted and a remanence of B_r=3600 gauss, the magnetic power as represented by the product $H_c \times B_r$ being about 1,860,000. Another alloy composed of 30% cobalt, 26% nickel, 4% silver, and 40% copper, after being heat treated, has a coercive force of H_c=720, a remanence of B_r=2700, the product being 1,940,000. It will be seen that merely by replacing in the first alloy 4% of its nickel content by an equal percentage of silver, an increase in coercive force together with an increase in remanence and hence a considerably increased power content are obtained. The exceptional effect of silver as compared with an addition of such other metals, as mentioned in Patent No. 2,170,047, will be seen from the comparison with a third alloy. An alloy of 30% cobalt, 25% nickel, 5% manganese, and 40% copper, upon heat treatment has a coercive force of H_c=540 and a remanence of B_r=3500, the product $H_c \times B_r$ being 1,880,000. It will be seen that in this alloy the gain in coercive force is accompanied by a drop in remanence so that the power content is low as compared with the silver-containing alloy.

The three alloys were melted in a high-frequency induction furnace and cast in ingot molds.

They were then annealed for ten hours at a temperature of 1100° centigrade, quenched in oil and finally heated at a temperature of 650° centigrade between four and sixteen hours.

Similar results are obtained with other percentile compositions of alloys containing cobalt, nickel and silver with a remainder substantially all of copper, provided these essential components stay within the above-stated limits. The expression "substantially all copper" is intended to include alloys whose remainder contains negligible impurities or additions of auxiliary nature, in particular those above mentioned, provided their nature and quantity is such as not to interfere with the desired magnetic qualities nor with the tensile strength, ductility and workability characteristic for these copper-base alloys. For instance, an alloy according to the invention containing the approximate amounts of 30% cobalt, 24% nickel, 2% manganese, 4% silver and 40% copper, is also characterized by a high coercive force and an increase in magnetic power, in particular after an annealing, quenching and tempering treatment as above described. Other compositions in accordance with the invention contain, for instance, 40% cobalt, 30% copper, about 25% nickel, the remaining 5% being silver alone, or 1 to 4% silver together with auxiliaries such as Mn, Al, Cr, V. A silver addition of up to 10% is also applicable to advantage in alloys containing about 60% or more copper together with approximately equal amounts of two or all three ferromagnetic metals of the iron group; for example, an alloy of 20% cobalt, 20% nickel, about 5% silver, remainder substantially all copper, may be mentioned.

WALTER DANNÖHL.
HANS NEUMANN.

Published May 18, 1943

Serial No. 417,521

ALIEN PROPERTY CUSTODIAN

METHOD AND ARRANGEMENT FOR DETERMINING UNDESIRED MODULATION IN TRANSMITTERS

Friedrich Woerner, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 1, 1941

This invention relates to a method for determing preferably detrimental modulations in tarnsmitter arrangements in which high-frequency oscillations are modulated for example in accordance with signals. An object of the invention is to provide a method and an arrangement for determining in simple manner whether the modulation of a transmitter operates without distortions or not, more particularly whether the modulation of a transmitter, which operates with alteration of the amplitudes of the radiated high-frequency oscillations, is free from undesired frequency-modulation or not.

Another object of the invention is to provide a simple method and arrangement for examining the quality of a transmitter operating with frequency-modulation.

The difficulties arising in performing a linear modulation are known. Further it is known that it is difficult to determine whether the modulation of an amplitude-modulated transmitter operates without distortions or not, more particularly whether an undesired frequency-modulation is effected.

The invention describes a method and arrangement respectively which allows to observe the condition of a high-frequency oscillation with respect to its frequency during a modulation-process operating with a depth of modulation lying between 0 and 100%. The invention is based on the fact that in superimposing a frequency-modulated carrier with a constant frequency there arise beat-frequencies having different frequency-values in accordance with the depth of modulation. In accordance with the invention the oscillation of a transmitter to be analysed or examined is modulated with a sinusoidal or preferably saw-tooth voltage of low frequency and heterodyned with an oscillation of constant frequency, and the resulting beat-frequency is applied to the control-grid of a cathode-ray tube (Braun tube, oscillograph and television-tube respectively). The electron-beam of this tube is scanning on the screen of the tube for example a rectangular area (frame) and a circular area respectively.

The frame frequency and the rotation-frequency respectively of this electron-beam is chosen to be the same as the frequency of the modulating oscillation of the transmitter to be analysed or examined and for example amounts to 10 to 100 cycles p.s.; if low beat-frequencies are to be expected it is chosen to 100–1000 cycles p.s., and, if higher beat-frequencies are to be expected, it amounts to still higher frequency-values.

The accuracy of such a measuring is greater if a rectangular scanning area (frame) of the electron-beam is used, and smaller in case of circular scanning by the electron-beam. The latter case means, that a polar diagram or a spiral diagram is shown on the screen of the tube. If a rectangular scanning area and a saw-tooth modulation-frequency is used and further an undesired frequency-modulation is present the effect on the image-screen of the tube is as follows:

The frequency of the transmitter is changing in accordance with the saw-tooth modulation-potential and correspondently also the resulting beat-frequency changes provided that the heterodyne-frequency is constant. This changing beat-frequency, which may be amplified in separate amplifier applied to the control-grid of the Braun-tube, causes the ray to describe on the screen a path in points or dashes. The distance of these points or dashes from each other varies in accordance with the frequency-value of the resulting beat-frequency provided that the line-frequency is constant. These distances are the larger the lower the beat-frequency. If the ray begins its path on the left upper side of the screen at the time $t=0$ and if the sawtooth modulation potential of the transmitter is increasing at the same time, there is produced, in case of a frequency-modulation, at first a low and later a higher beat-frequency, which means that at first the points appear on the screen at first in larger, later in smaller distances or vice versa depending on the constant heterodyne-frequency being higher or lower than the modulated transmitter-frequency. Accordingly there results on the screen in case of a rectangular scanning area an image consisting of diverging lines (as shown for example in Fig. 2).

The line-frequency needs not to be high and amounts for example to 2500 up to 5000 cycles corresponding to an image or scanning area with 100 to 200 lines and 25 frames p.s. If the line- and frame-frequency is known, one may measure in simplest manner on the screen the frequency-change for each value of the depth of modulation of the transmitter.

As already mentioned above the transmitter may be also modulated with a sinusoidal oscillation, and then the period of the oscillation changes if a frequency-modulation arises.

If a polar diagram is used on the screen the circuit arrangement is the same except the pro-

duction of the polar potential. The accuracy of measuring, however, is smaller since the whole modulation characteristic is signed along the extent of the single circle and accordingly the distances of the points or dashes on the screen are very small, more particularly for high beat-frequencies. In case of such polar diagrams there are various possibilities of forming the image on the screen. For example the electron-beam may be intensity-modulated and then it reproduces on the screen a circular curve consisting of single points, the distances of which are varied. Further, for example, also the beat-frequency may be applied to a concentric deflecting system of the cathode-ray tube, and then the beat-frequency appears on the screen in form of a sinusoidal wave for example. Using a spiral diagram on the screen a larger accuracy is effected than in case of a circular diagram since in a spiral diagram the spiral curve has a longer extent than a circular curve.

In the accompanying drawings Fig. 1 represents diagrammatically an arrangement in accordance with the invention. Figs. 2–5 show some forms of diagrams on the screen of the cathode-ray tube.

Referring specifically to Fig. 1 **1** is the transmitter set to be analyzed or examined, **2** is the oscillator which generates the constant heterodyne-frequency, **3** is a mixing-detector-stage, wherein the modulated oscillations of the transmitter are mixed with the constant local oscillation of **3** and which may be associated with an amplifier stage, **4** designates a generator for the relaxation oscillations effecting the horizontal and vertical deflection of the ray in the Braun-tube **5**, the image-screen of which is shown. One of both the relaxation-oscillations generated by **5**, f. e. the frame frequency, is used for modulating the transmitter **1** and accordingly connected also to **1** as shown.

Fig. 2 shows the image on the screen, if a few frequency-modulation of the transmitter occurs. In this case diverging strips or lines appear on the screen.

Fig. 3 shows the image on the area, if no frequency-modulation occurs. It is obvious from these Figs. 2 and 3 that the method of the invention thus allows to state at once any for example undesired distortion of the modulation.

Fig. 4 shows the image on the screen, if a polar diagram i. e. a circular diagram is used. In this case a circular curve of wave-form appears on the screen and an undesired frequency modulation then may be concluded from the change of the period of this wave on the screen. This curve of wave-form is produced, if the beat-frequency is applied to a concentric deflecting system of the Braun tube. If, however, the electron-beam is intensity-modulated, then there appears no wave-formed circular curve on the screen but a circular curve consisting of single points or dashes; and in case the transmitter to be examined is for example frequency-modulated the distances of these points or dashes vary.

Fig. 5 represents the screen with a spiral diagram in case the intensity-modulated transmitter is distorted by an undesired frequency modulation.

The invention makes possible to analyse the oscillations of a transmitter set and to make apparent any, for example undesired, change of the modulated oscillations i. e. each distortion of the transmitted oscillations. On the other hand the method or the apparatus in accordance with the invention allows to state the modulation-quality of a transmitter operating with frequency modulation. For example a linear frequency-modulation may be concluded from the symmetrical diverging strips on the screen of the Braun-tube in accordance with Fig. 2.

Further the method according to the invention allows to reveal other defects of a transmitter, for example the humming noise. If such a humming noise is produced the diagram on the screen must show curved lines instead of rectilinear lines provided that the oscillator (**2**) operates without distortions.

FRIEDRICH WOERNER.

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BY A. P. C.

F. WOERNER

METHOD AND ARRANGEMENT FOR DETERMINING UNDESIRED MODULATION IN TRANSMITTERS

Filed Nov. 1, 1941

Serial No. 417,521

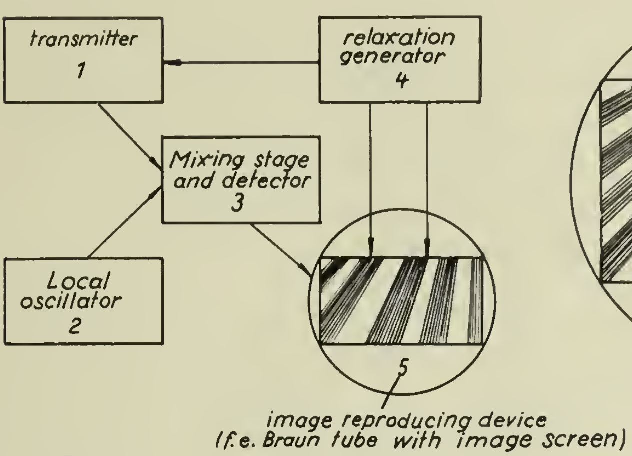


Fig. 1.

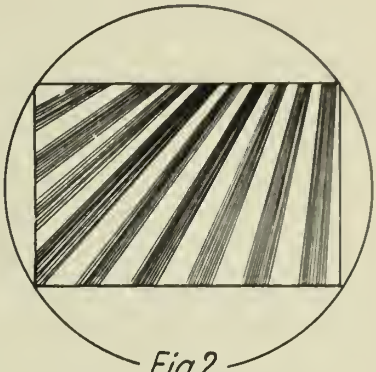


Fig. 2.

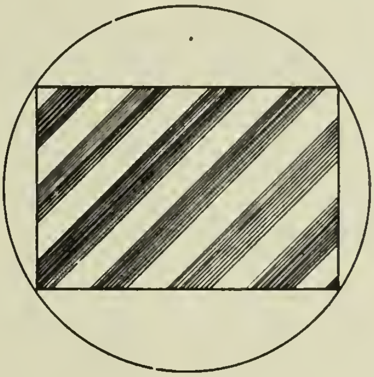


Fig. 3.

Fig. 4.

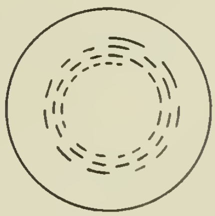


Fig. 5.

Inventor:

Friedrich Woerner.

Published May 18, 1943 Serial No. 419,794

ALIEN PROPERTY CUSTODIAN

AUTOMATIC SIGNALLING APPARATUS FOR STREET-CROSSINGS ETC.

Daniel Nærbö, Stavanger, Norway; vested in the Alien Property Custodian

Application filed November 19, 1941

The invention concerns an automatic signalling apparatus for street-crossings etc., of the kind in which there is placed in the roadway near the corner or turn of the street a plate which will be pressed down by the weight of the passing vehicle, whereby a piston arranged in a cylinder under the roadway is forced downwards and the pressure conveyed through a liquid contained in the cylinder will force up a movable piston in another cylinder which is in communication with the aforesaid cylinder, the raising of which latter piston causes a signalling device located at the street-crossing to come into action.

Apparatuses of this kind are known, in which the piston set in motion by the pressure of the liquid directly moves a mechanical signal, and further are known apparatuses in which the said piston acts upon an electric switch for lighting up an electric signal-lamp. The present invention involves an apparatus of the last-mentioned kind, in which the signalling apparatus comprises one circuit for a "clear"-signal and one circuit for a "stop"-signal, and its purpose is first of all to provide for such an apparatus an electric switch which will be more reliable in its functioning than those employed in the hitherto known apparatuses of this kind.

The characteristic feature of the apparatus according to the invention consists mainly in the fact that the making and breaking of the circuits for "clear", and "stop"-signals are effected by means of a contact-member, mechanically connected with the piston moved by the pressure of the liquid, which member during the movement of the said piston from its lowest to its highest position brings about an electric connection firstly between two stationary switch-elements in the "clear"-signal circuit and afterwards between two such elements in the "stop"-signal circuit.

The further objects and advantages of the invention will appear from the following description with reference to the annexed drawing, which diagrammatically illustrates an arrangement according to the invention.

In the drawing Fig. 1 diagrammatically shows the whole apparatus, partly in front-elevation and partly in section.

Fig. 2 shows on a larger scale the piston moved by the pressure liquid and the switch connected therewith, in axial section and partly in elevation.

Fig. 3 shows a ground-plan of the switch.

In the drawing, 1 indicates a plate working on a hinge 2 and placed in the roadway, for example 30 metres from the corner or turning of the street, and kept in its highest position by means of a spring 3. Under the plate there is placed a piston 4, on the upper end of which the plate 1 rests, which piston can be made to move vertically in a cylinder 5. In the cylinder, beneath the piston, are placed springs 24, which tend to keep the piston in its highest position. The cylinder 5 is connected through a pipe 6 with another cylinder 7, which likewise contains a vertically movable piston 8. The cylinders 5 and 7 and the pipe 6 are filled with a compressed liquid.

At the inlet to the cylinder 7 is placed a flap-valve 9 which prevents return-flow of the liquid from the cylinder 7 to the pipe 6. Such return flow can take place only through the by-pass 10, and the resistance to flow through this by-pass can be regulated by means of the adjusting screw 11.

The piston 8 is at its upper end provided with an upwards projecting piston-rod 12, the upper end of which bears a cross-piece 13, which is electrically insulated from the piston-rod by means of the insulation 26. The cross-piece 13 bears two arms, rotatable on parallel horizontal axles 14, 14', which are held apart from each other by the pressure of a spring 15. The arms 14, 14' have at their upper ends contact-rollers 16, 16'. Each of the contact-rollers 16, 16' acts together with a set of contact-bars 17, 18, 19 and 17', 18', 19'.

The bars in each set are arranged in succession to each other at the bottom of the guiding-grooves 20, 20', executed in insulating material, a small space filled with insulating material being interposed between the bars 17 and 18 and 18 and 19 respectively, and likewise between the bars 17' and 18' and 18' and 19' respectively.

21 denotes a signal-post provided with a green light 22 for the "clear"-signal and red lights 23 for the "stop"-signal. The "clear"-signals 22 is in a circuit (not shown in the drawing), embracing the contact-members 17, 17', while the "stop"-signals 23 are in another circuit embracing the contact-members 18', 19' on the one side and 18, 19 on the other side. 27 and 28 denote coupling-boxes for the conducting-wires, not shown.

The mode of action of the arrangement is as follows:

In the drawing the apparatus is shown in a state of rest. The contact-rollers 16, 16' are in contact with the members 17 and 17' respectively and close the circuit for the "clear"-signal 22.

The current passes from the contact-bar 17 through the contact-roller 16, the arms 14, 13, 14′, the contact-roller 16′ and the contact-bar 17′ and further to the "clear"-signal 22.

When a vehicle, such as an automobile, passes over the plate 1, this latter is pressed down, whereby the piston 4 is forced down into the cylinder 5 and thus presses the liquid through the pipe 6 and into the cylinder 7. The piston 8 is thereby lifted up and the contact-rollers 16, 16′ are raised to the position shown by the stippled lines in Fig. 2. The circuit for the "clear"-signal is now broken and the circuit for the "stop"-signal 23 is closed. As soon as the vehicle has passed over the plate 1, this is again raised and the pistons 4 and 8 begin to return to their initial position under the influence of the springs 24 and 25. As already mentioned, the liquid is prevented by the stop-valve 9 from flowing back direct from the cylinder 7 to the pipe 6, but must flow through the by-pass 10. The result of this is that the piston 8 and therewith the contact-rollers 16, 16′ only slowly sink down. The "stop"-signal therefore continues to burn for a certain time, until the contact-rollers come down to the lower ends of the contact-bars 19, 19′. The "stop"-signal is now extinguished, but is immediately afterwards lighted again when the rollers 16, 16′ come into contact with the bars 18, 18′. These latter are made very short, so that the "stop"-signal is immediately afterwards again extinguished, whereupon the "clear"-signal is lighted.

By means of the adjustment-screw 11 the action of the "stop"-signal can be regulated as desired.

Instead of being placed under the plate 1 as shown in the drawing, the switch may be located overground, for instance in a tightly closed box at the side of the street or road, or possibly in the signal-post.

This latter embodiment involves the advantage that the switch is not so much exposed to moisture as when it is placed beneath the plate 1. If the switch is placed in the signal-post, there is also effected a saving of armoured cable from the switch to the post.

DANIEL NÆRBÖ.

PUBLISHED

MAY 13, 1943.

BY A. P. C.

D. NAERBÖ

AUTOMATIC SIGNALLING APPARATUS FOR STREET CROSSINGS ETC

Filed Nov. 19, 1941

Serial No. 419,794

Fig. 2.

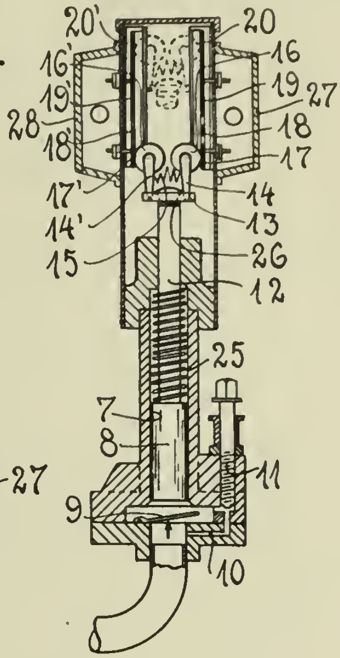


Fig. 3.

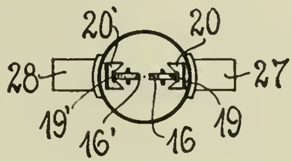
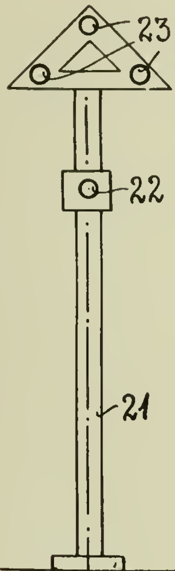
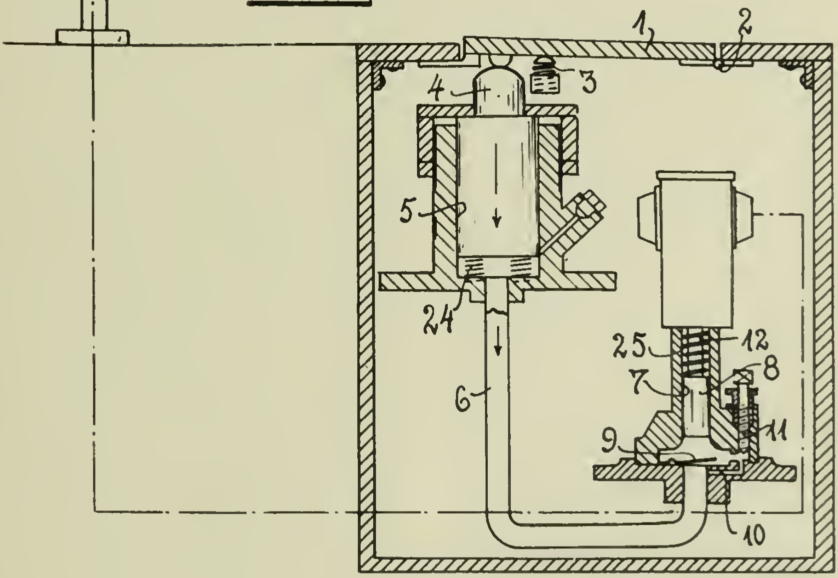


Fig. 1.





Inventor
D. Naerbö
By C. F. Wenderoth, atty

Published May 18, 1943 Serial No. 420,572

ALIEN PROPERTY CUSTODIAN

SINGLE-PHASE MACHINES OF THE COMMUTATOR TYPE AND IN THE CIRCUIT ARRANGEMENT OF THEM

György Lorschy, Budapest, V., Hungary; vested in the Alien Property Custodian

Application filed November 26, 1941

This invention relates to single-phase machines of the commutator type and especially to circuit arrangements for supplying such machines from a source of three-phase current.

In order to transform without any special expedient a series wound single-phase motor of the commutator type into a motor with shunt characteristic certain circuit arrangements have been employed where the phase displaced voltages of the armature winding and the field winding of the motor are taken from a three-phase system. There is especially a method already known of connecting the armature winding with one and the field winding with another line voltage of a three-phase system. The drawbacks of this arrangement are that wrong connections may easily occur, that the motor receiving an exceedingly high no-load current, its efficiency is necessarily extremely low, and that all lines of the three-phase system are differently loaded.

There is also another method already known of connecting a single-phase motor of the commutator type with a source of three-phase current so that the requisite phase displacement of the said voltages is effected by means of a transformer on which the line voltage of the source of three-phase current is impressed, and to the middle of which one terminal of the field winding is joined. The drawback of this solution is the indispensable application of a special transformer, which as a necessary evil renders the machine especially in a smaller plant more expensive, more difficult to handle and which may easily be a source of mistakes.

Finally a similar arrangement has been proposed but with the application of two coupled single-phase motors joined to a three-phase system by Scott's transformer connection where the latter is performed by means of the windings of the motor themselves. The disadvantage of this arrangement is that always only motors of the same size and efficiency, which must be made also to harmonize with each other most accurately in many another respect, can be applied, in pairs, coupled with each other mechanically without being able to obtain a shunt characteristic. The invention seeks to remove the drawbacks above referred to.

The object of the invention is to effect the phase displacement of about 90 degrees required between the voltage of the field winding and that of the armature winding by means of windings with which the machine as a rule is in any case equipped to its own purposes.

Another object comprises the exclusion of erroneous connections.

A further object of the invention is to ensure for the machines without any special devices to be provided for this purpose a shunt characteristic and the most favourable electrical properties.

A still further object comprises a free scope for speed regulation within wide limits, also independently from the load carried by the machines at the moment and assuring the feature that the machines in question, whilst on the one hand, the difference between their speeds at no-load and under load is relatively small, they will, on the other hand, generally impose an incomparably more uniform load on each of the various branches of the three-phase system, than has been obtainable with such arrangements as were employed for the intended purpose, up to now.

The invention consists essentially in this, that of the field and armature and in certain cases the compensating respectively the working winding of the machine one terminal of one of these kinds of windings is connected to the middle or about to the middle of a winding of them which is firmly fixed in the machine and, which in its turn, influences inductively the armature winding during the action and both terminals of which are in a well known manner, directly or indirectly—for instance through a voltage regulator—connected to each phase line of the source of three-phase current concerned.

The circuit arrangement according to the invention effects the phase displacement required between the voltage of the field winding and that of the armature winding by means of a winding with which the machine as a rule is in any case equipped, automatically and independently of the load of any time.

As for the other terminal of the winding halving another winding firmly fixed in the machine which in its turn influences inductively the armature winding of the machine, it is the most suitable way to connect it with the third phase line of the source of three-phase current concerned.

That alternative of circuit arrangement according to the invention may be exceedingly important in practical respect where both terminals of the field winding and one terminal of the armature winding are in a well known way di-

rectly or indirectly—for instance through a voltage regulator—connected with each of the phase lines of the source of three-phase current, whereas the other terminal of the armature winding is connected to the middle or about to the middle of the field winding of the machine concerned.

A particularly suitable single-phase motor of the commutator type for such circuit arrangement according to the invention is characterized by a junction terminal leading practically immediately to the middle or about to the middle of one of the windings firmly fixed in the machine and influencing inductively its armature winding during the action.

Several such junction terminals may also be disposed, without any difficulty of construction, at or about the middle of this kind of winding in order to ensure a certain adaptability in the connection.

The said junctions may be of course adjustable.

The drawings represent diagrammatically a few examples of circuit arrangements embodying my invention. Like numerals in them designate corresponding parts throughout.

Fig. 1 is a diagrammatic representation of a two pole single-phase motor of the commutator type supplied from a source of three-phase system.

Fig. 2 and 3 represent similar arrangements, but employing a transformer in the circuit of the field winding and of the armature winding respectively.

Fig. 4 represents the arrangement according to Fig. 1, inserting also a compensating winding.

Fig. 5 represents the arrangement according to Fig. 4, but short-circuiting the compensating winding.

Fig. 6 corresponds also to the arrangement according to Fig. 4, but employing an adjustable connection between the armature winding and the compensating one.

Fig. 7 represents a similar arrangement to Fig. 4, but interchanging the connections of the field and the compensating winding with each other.

Fig. 8 represents the arrangement according to Fig. 7, but short-circuiting the armature winding.

Fig. 9 shows similar arrangement as Fig. 8, but completed with a transformer.

According to Fig. 1, the field winding 4 of a single-phase motor of the commutator type is connected between the phase lines **1**, **2** of a three-phase system **1**, **2**, **3**, and the armature winding 5 is connected between the third phase line **3** and the middle or about the middle of the field winding **4**.

It is to be noted at this point that "winding" throughout means simple windings as well as multiple windings or winding systems.

Fig. 2 shows a similar circuit arrangement only with the addition, that the field winding 4 is connected between the phase lines **2**, **3** and one terminal of the armature winding **5** is connected with the phase line **1**, furthermore that the circuit of the field winding **4** possesses the auto-transformer **6** which can be regulated by itself.

Fig. 3 shows again the only addition, that the phase connections are further interchanged and that the auto-transformer **7** is employed in the circuit of the armature winding **5**.

The drawings show that both auto-transformers **6**, **7** are provided with tappings. These transformers which can be inserted in both circuits at the same time may be freely chosen as to their kind of construction. They permit of influencing the working conditions within wide limits, for instance speed regulation without practically any loss as well as obtaining, if necessary, a low working voltage even from a high network voltage.

Compensating and/or auxiliary pole windings may continue to be employed in the usual manner.

Fig. 4 shows how the circuit arrangement according to Fig. 1 is—in a well known manner—completed by a compensating winding **8**.

Fig. 5 represents the arrangement according to Fig. 4, where the line **9** short-circuits the compensating winding **8**.

Fig. 6 represents how the motor of the arrangement according to Fig. 4 can obtain a synchronous speed or one different from that according to the distance by which the adjustable contact of the lead **10** along the compensating winding **8** is moved more or less to the right, i. e. to the approximity of the armature winding **5**.

Fig. 7 shows again the arrangement according to Fig. 4, where the connection of the field winding **4** and that of the compensating winding **8** are interchanged. One terminal of the latter is connected with the phase line **1** and one terminal of the field winding **4** joins to the middle or about to the middle of the compensating winding **8**. The requisite phase displacement between the voltages impressed on the two kinds of windings is again present.

The other usual modes of connection of the compensating winding **8** continue also to be admitted. It suffices even to have between the two kinds of windings **5**, **8** an inductive connection instead of a conducting one.

Fig. 8 shows similar arrangement as Fig. 7, but connecting one terminal of the field winding **4** with the phase line **1**.

The lead **11** short-circuits the armature winding **5** so that the compensating winding **8** figures really as a working winding.

Fig. 9 represents a similar arrangement as Fig. 8. The armature winding **5** connected only inductively with the windings **4**, **8** may obtain for the purpose of speed regulation different voltages from a transformer **12**, the high voltage winding **13** of which is connected with the phase lines **2**, **3**, i. e. those on which the compensating winding is laid, the contact of the lead **15** being adjustable along the low voltage winding **14** of the transformer **12**.

GYÖRGY LORSCHY.

PUBLISHED

MAY 18, 1943.

BY A. P. C.

G. LORSCHY

SINGLE-PHASE MACHINES OF THE COMMUTATOR TYPE AND IN THE CIRCUIT ARRANGEMENT OF THEM

Filed Nov. 26, 1941

Serial No. 420,572

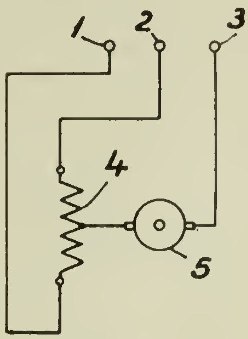


Fig. 1.

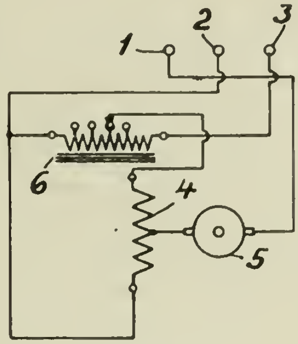


Fig. 2.

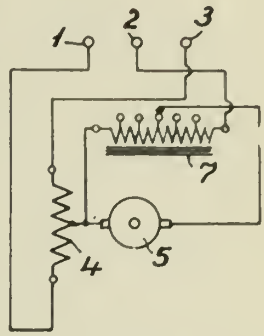


Fig. 3.

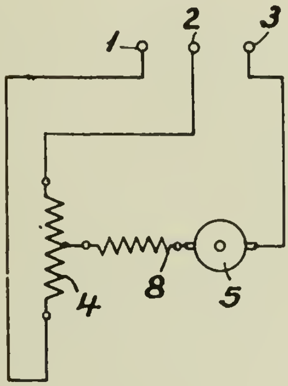


Fig. 4.

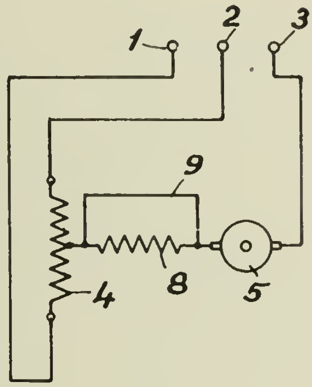


Fig. 5.

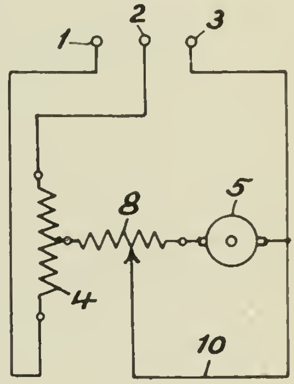


Fig. 6.

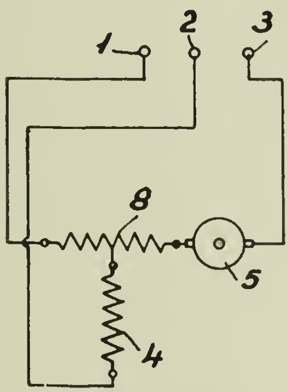


Fig. 7.

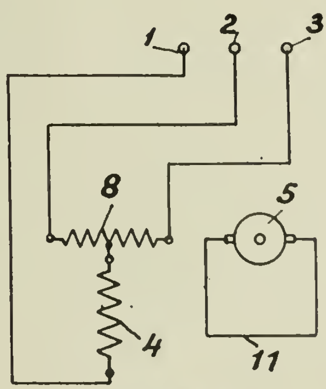


Fig. 8

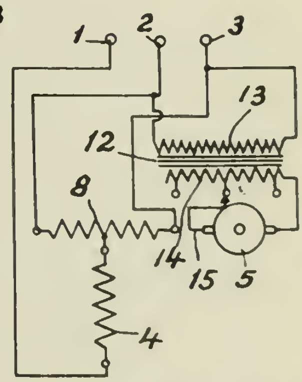


Fig. 9.

Inventor.
G. Lorschy
By: Glascock Downing & Seebold

Published May 18, 1943

Serial No. 425,186

ALIEN PROPERTY CUSTODIAN

PROCESSES FOR MACHINING LIGHT METALS AND ALLOYS

Jean Bary, Clichy, France; vested in the Alien Property Custodian

No Drawing. Application filed December 31, 1941

The present invention has for object improvements in processes for machining light metals and alloys, in particular in processes in which the members must be distorted by tools against which the surface of said members must slide under pressure, for instance in drawing, extruding crimping, stamping operations, etc.

According to this invention, the surface of the members made of light metal or alloy which are to be machined, is converted into a thin layer of oxides or of stable compound salts, which is firmly anchored to the subjacent metal and which is capable of retaining in a thin and continuous film one of the lubricants generally used in the above-mentioned machining operations.

The members thus treated can be subjected, without intermediate annealing, to distortions at least twice as important as by the usual processes. For instance, a tube blank made of alloy currently called Duralumin or Avial can withstand, after such a treatment, an elongation by cold drawing, without annealing, of more than 100%.

The applicant has already proposed to treat steel members for a similar purpose and in a similar manner, by means of solutions with a basis of metallic phosphates and nitrates; but said solutions are not suitable for the treatment of light metals and alloys.

Here are, on the contrary, a few examples of methods of treatment giving good results with these particular metals and alloys:

1°—Chemical treatment in a bath composed of:

	Grams
Fluovanadate of potassium	10
Fluosilicate of sodium	2
Molybdate of sodium	2
Double tartrate of sodium and of potassium (Seignette salt)	2

for 1.000 cc. of water.

Preferably 15 to 20 minutes at about 60° C. The fluovanadate can be replaced by other halogenated salts of heavy metals.

2°—Chemical treatment in a bath composed of:

Carbonate of sodium	grams	8
Phosphomolybdate	do	2
Chromate of sodium	do	10
Water	cubic centimeters	1.000

Preferably 20 to 30 minutes, at boiling point.

3°—Anodic electrolytic treatment in one of the baths commonly used for that purpose, by regulating the current in such a manner that the film of oxides obtained is sufficiently coherent and has such an opacity that it perfectly retains the film of lubricant used for the operations of mechanical distortions.

It is to be noted that the economy obtained by the present process results, not only from the elimination of one or more annealing operations, which are always costly, but also from the saving in time and labour resulting from the elimination of the heat treatments which were compulsory up to now, in this kind of work.

It is to be understood that the applicant does not intend to claim the treatments indicated above by way of example and all others, moreover known per se, for ensuring the protection against oxidation or the decoration of the machined members, the essential feature of the invention consisting, on the contrary, in treating the members before they are machined, that is to say not for their protection or their decoration but in order to facilitate, as above indicated, these various machining operations; the latter being terminated, it will moreover be advisable to again subject the members to the usual protecting or decorating treatments.

JEAN BARY.

Published May 18, 1943 Serial No. 427,649

ALIEN PROPERTY CUSTODIAN

MERCURY AMPEREHOURMETERS

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Application filed January 21, 1942

The present invention relates to mercury amperehourmeters used for indicating at any moment the amount of electricity available in a storage battery during its discharge period. Such amperehourmeters usually comprise a mercury trough containing a motor disc rotating between two electrodes for the supply of current.

The motor of the amperehourmeter, inserted in the battery circuit, rotates in one or the other direction according as to whether the battery is being charged or discharged. During the charge, the amperehourmeter gives increasing indications and records the number of stored amperehours. During discharge, it will give decreasing indications corresponding to the decreasing number of amperehours available in the battery.

Since the average efficiency of the battery is always less than unity, the indicating members of the amperehourmeter must, for currents equal in absolute value, rotate faster during discharge than during charge.

On the other hand, the efficiency of the battery does not remain constant. Its capacity will vary indeed with the rate of discharge the battery is being subjected to, and also with the temperature.

The present invention concerns improvements to amperehourmeters for compensating the variations in capacity of a storage battery according to the surrounding temperature and according to the rate of discharge.

According to the invention, the amperehourmeter motor is placed under the control of a member sensitive on one hand to the variations of the surrounding temperature, and on the other, to the variations of the current flowing through the battery circuit.

According to one embodiment of the invention, one of the supply electrodes of the amperehourmeter is movable and placed under the control of members deformable by heat, such as devices of the bi-metal or thermo-sensitive strip type.

The electrode is preferably rotatable and the controlling thermosensitive strips are embodied in the form of spirals or coils, the axis of which coincides with the axis of the desired rotation.

For effecting the required corrections, indicated above, two thermosensitive strips, acting in opposite directions to one another, are subjected, one to the surrounding temperature, and the other, directly or not, to the heating effect due to the discharge current or to a suitable fraction of the latter.

A preferred embodiment of the invention is shown by way of example in the annexed drawing in which:

Fig. 1 is an elevational section of the improved amperehourmeter, and

Fig. 2 is a plane view of the mercury trough and the enclosed members.

The apparatus shown on the drawing comprises a horizontal trough 10 containing mercury, in which is rotatable a disc 11 of a metal which is a good conductor of electricity; the disc is carried by an axis 12 terminated at its lower end by a pivot pin 13 resting in a cup bearing 14 provided at the centre of the trough.

Above the trough, made of a non-magnetic substance, is arranged a core 15 of a permanent magnet or a permanently excited electromagnet. Above the pole pieces of said core and at the upper part of the trough is fixed an annular armature 16 causing the magnetic flux to pass perpendicularly through two diametrically opposed regions of the disc 11.

The trough 10 is covered by a cup 17 arranged in the known manner for preventing to upset the mercury when the apparatus is being transported in any position.

At the inner periphery of the trough is arranged a fixed electrode 18 connected to a conductor 19 belonging, directly or not, to the discharge circuit of the metered battery. Another electrode, 21, also immersed in the mercury, is arranged at the end of an arm 22 terminating horizontally the lower part of a thermosensitive strip wound as vertical coil 23 around the axis 12 of disc 11, but without contact with the latter. The strip is fixed by its upper part to a conducting ring 24 which is itself attached to the lower end of a second thermosensitive strip 25 suspended to a post 26 carried by the cup 17. This second strip 25 is adapted, either by its constitution or by the direction in which it is wound, to act in the direction opposite to the first when its temperature is being increased.

The conducting ring 24 is connected by a very flexible connection 27 to a conductor 28 closing the circuit of the apparatus.

The latter is completed, as usual, by a screw 29 carried by the axis 12 and driving the primary pinion 30 of a gear adapted to indicate the number of amperehours still available in the battery.

The thermosensitive strips 25 and 26 are arranged in a manner that at rest and when the surrounding temperature is high, the movable electrode 21 is in the swung out position shown in A on Figure 2, in which the path of the electric

current in the disc will cut only partially the field flux set up by the magnet or electro-magnet.

When a moderate discharge current flows, causing no decrease in the battery capacity, the disc will rotate at a given speed and the complete record of the supplied amperehours will give the value of the amperehours still available.

If the discharge current is increased, the battery capacity will be correspondingly decreased, but the lower thermostrip **23**, passed by said current or a fraction of it, will be heated by Joule's effect and the movable electrode **21** will rotate until it occupies a position which is for instance that indicated by B, thus setting up a different distribution of the current lines in the disc with respect to the field flux, thereby causing the disc to rotate faster and thus indicate a number of remaining amperehours with due consideration of the decrease of the battery capacity and corresponding to the amperehours effectively available.

Likewise, if the surrounding temperature decreases, the effective capacity of the battery is correspondingly decreased, but the upper thermo-strip **25**, subjected to said temperature, will change in shape and rotate the thermo-strip **23** together with the movable electrode **21** towards position C, in which the disc will rotate comparatively faster than before, thus accounting for the decrease of the battery capacity in the indication of the remaining amperehours.

The apparatus is, of course, calibrated in a manner that position C corresponds to the strongest discharge current and to the lowest surrounding temperature foreseen.

When a decrease of current or an increase in the outer temperature, or both, are set up, the movable electrode **21** will move towards the initial position A by an amount corresponding to the ratio between the effective and rated capacity of the battery, with due consideration, of course, to the amperehours already consumed and the previous discharge conditions.

Thus, due to the improvements according to the invention, the apparatus will correctly perform its function as a meter and prevent any false indications in the use of the battery, especially when the latter actuates the motors of an electric vehicle which has to be returned periodically to the charging station.

The invention is, of course, not limited to the example described, and it is possible, without departing from its general scope, to perform any desirable constructional alterations; thus, the thermosensitive strips, instead of being wound as coils, could be arranged as spirals.

The apparatus could further comprise, either in addition to the thermo-strip **23** or instead of the latter, an electromagnetic compensating device acting upon the field flux in terms of the rate of discharge.

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PUBLISHED
MAY 18, 1943.
BY A. P. C.

A. F. H. PONCET

MERCURY AMPEREHOURMETERS

Filed Jan. 21, 1942

Serial No. 427,649

Fig. 1

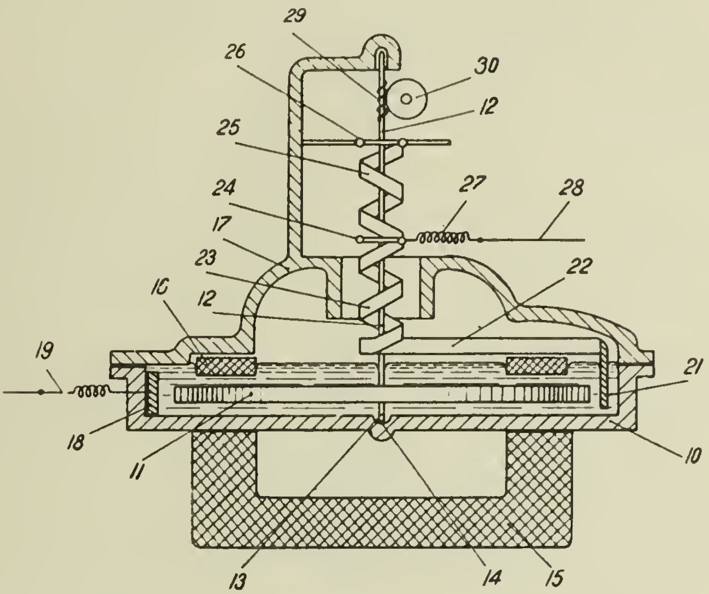
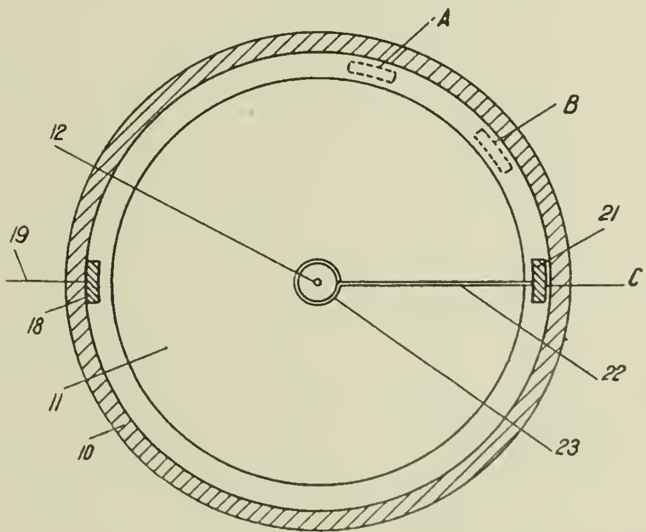


Fig. 2



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BY
Young, Emery & Thompson
ATTYS.

Published May 18, 1943

Serial No. 428,442

ALIEN PROPERTY CUSTODIAN

IRON POWDER CORE

Kurt Kaschke, Berlin-Neukolln, Germany; vested in the Alien Property Custodian

Application filed January 27, 1942

This invention relates to an improved iron powder core of the type used for tuning electric resonant circuits in radio receivers and similar apparatus and to a method of producing such cores after the so called permeability tuning method which has been described for instance in U. S. Patents No. 2,082,595 and 2,051,011.

It is an object of the present invention to provide an iron powder core which is easy to make in the oblong shape which is required for permeability tuning purposes.

In order to cover a wave range, for instance, from 200–600 meters a variation of the inductance of at least 1:9 is required. To effect such a great inductance variation, windings of considerable length have been used with oblong pencil-like cores arranged to be moved in the winding. The production of iron dust cores of such longitudinal shape has caused considerable difficulties since the cores are required to combine low losses and high permeability. In many instances cores are required having a permeability above 30 corresponding to a specific density of over 6. The conventional process of compressing the iron powder mixture in a tubular hollow mould by means of a piston sliding in said mould did not give satisfactory results. Owing to the high friction at the walls of the mould the pressure could not be evenly distributed throughout the core structure but the central portion of the core proved to be insufficiently compressed. Moreover, the insulation of the magnetic particles at the surface of the core is liable to injury owing to the friction exerted upon the core surface as the same is ejected from the mould, producing a conductive metal skin which tends to increase the losses in the iron core.

According to the present invention iron dust cores of the type above referred to are made in the form of symmetrical halves which are divided in an axial direction of the core and subsequently united to form a round rod shaped iron core. The core halves are compressed in a direction perpendicularly to the axis of the core and then connected together, preferably with the aid of an adhesive. This method offers the advantage that the cores can be made on automatically operating machines, and can be readily removed from the mould without any danger of injury to the insulation at the surface of the cores. Moreover, the cores can be made with a very uniform structure and, if desired, holes or other recesses of any shape can be provided in the cores. For example, conical bores or undercut bores or threaded bores can be produced. Further, lateral flat faces of tapered or other shape can be provided such as are required, for instance, in order to produce inductance changes of a predetermined characteristic.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing showing by way of example and purely schematically some embodiments of the invention and in which

Fig. 1 is a perspective view of two core halves constituting the elements of a core having the invention applied thereto.

Fig. 2, 3 and 4 are modified core halves including central recesses.

Fig. 5 is a central section of a permeability tuning device including a core made in accordance with the present invention.

Fig. 6 is an axial section through a mould adapted for making cores in accordance with the present invention and

Fig. 7 is an axial section similar to Fig. 6, but showing the parts of the mould in another working position.

Referring now to the drawing in greater detail and first to Fig. 1, it will be noted that the oblong core is made of two semi-cylindrical core halves **1** and **2** which may consist of any suitable mixture of magnetic powder and an insulation binder, with or without an individual insulating skin applied on each particle. It should be noted that the term, "iron powder" or "magnetic powder" as used in this specification is intended to comprise any metal or other material whose permeability is greater than 1 and whose high frequency losses are so low that the material may be used in high frequency devices.

Referring to Figures 2, 3 and 4 it will be seen the the core halves in this case are provided with recesses, i. e. the core of Fig. 2 is provided with a cylindrical bore **17**, that of Fig. 3 is formed with a threaded bore **4**, and the core of Fig. 4 is provided with a differential bore, the diameter of the inner section of the bore being larger. In addition, the recess of the core of Fig. 2 is formed with lateral tapered surfaces **3**, while the core of Fig. 4 is formed with a conical bore **6**. The tapered surfaces **3** of Fig. 2 and the conical bore **6** of Fig. 4 serve to vary the effective permeability of the core in such a manner that the effective permeability is decreasing towards one end of the core.

Fig. 5 illustrates a permeability tuning device comprising a core **18** which consists of two halves and is provided with tapered lateral surfaces in

accordance with Fig. 2 and with a hook 7 which may be seated in a bore similar to that indicated at 5 in Fig. 4, and a winding 8 having a relatively high ratio of length to diameter.

A very suitable method of making core halves according to the invention will now be described with reference to Figs. 6 and 7.

The pressing tool shown in these figures comprises a casing 10 of hardened steel cheeks 11 making up the mould and received in a recess of the casing, and a lower punch or piston 13. An upper punch 15 is formed with a semi-circular projection 14 to produce recesses like those indicated at 17, 4 and 5 in Figs. 2, 3 and 4 respectively.

This pressing tool operates as follows:

The space in mould 11 is at first filled with a suitable mixture of magnetic powder and a binder. Now the upper punch 15 is moved downwards to compact the powder into a semi-cylindrical shaped article 16. Following the compression punch 15 is retracted and the lower punch 13 is pushed upwards to eject the cheeks 11 as indicated in Fig. 7, whereby the moulded part 16 is set free and may be removed by hand without any injury to its surface. Punch 15 now returns to its initial position, allowing cheeks 11 to assume their initial positions shown in Fig. 6, and the whole cycle of operations may be repeated. A pair of such core halves may now be united, for instance, by glueing them together with the aid of an adhesive which may consist of a solvent adapted to dissolve the insulating binder contained in the core.

My improved method may also be used for the production of hollow and complicated bodies which are made by compressing and sintering metal powder and may be used for any purposes such as bearing bushes.

KURT KASCHKE.

PUBLISHED

MAY 18, 1943.

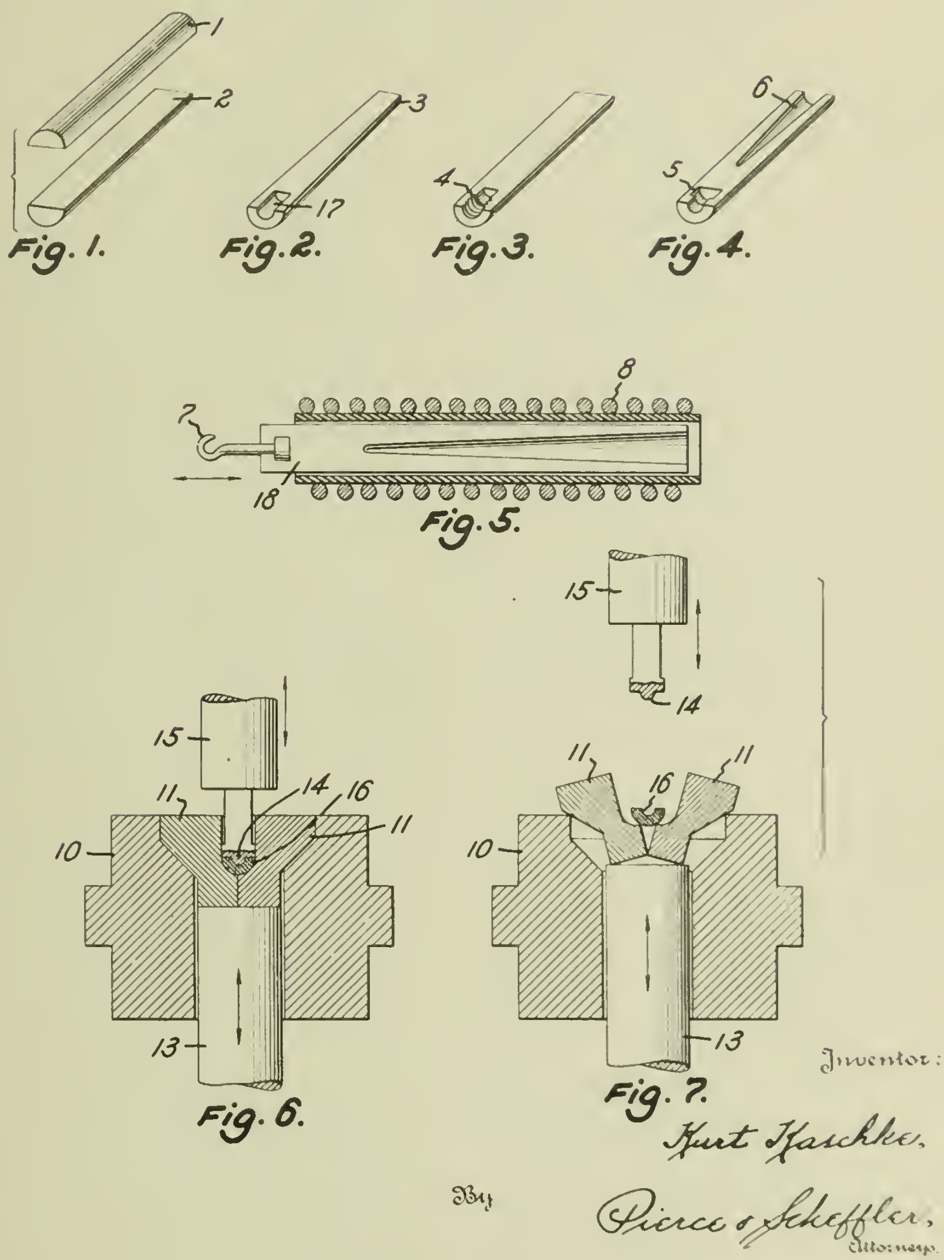
BY A. P. C.

K. KASCHKE

IRON POWDER CORE

Filed Jan. 27, 1942

Serial No.
428,442



Published May 18, 1943

Serial No. 431,207

ALIEN PROPERTY CUSTODIAN

BALANCED CONTROL FOR CYCLE BRAKES

Marcel Paul Durand, St-Germain en Laye, France; vested in the Alien Property Custodian

Application filed February 17, 1942

The object of the present invention is a control system for cycle brakes actuated by back-pedalling, which operates simultaneously on both wheels of the cycle in a balanced manner, that is to say by distributing the power applied by back-pedalling according to a predetermined proportion between the two brakes.

The essential feature of the apparatus which forms the subject matter of the invention is a casing, provided with pawls, mounted on one of the cranks of the cycle and carrying two pulleys offset in such a way as to accommodate a cable arranged in the form of an S, which clears the crank-axle, the lower strand of which cable is led towards the rear brake, below the rear fork, and the upper strand of which is led towards the front brake, both of said strands emerging tangentially from the pulleys on which the cable runs freely for the purpose of distributing the braking effect between the two brakes.

It should be noted that the fitting of said coupled and balanced brake control in nowise excludes the possibility of connecting up the same brakes to individual controls—hand operated for instance—so as to constitute emergency controls.

The accompanying drawings represent a preferred embodiment of the invention merely as an example thereof and without in any way limiting its scope thereto.

Fig. 1 is a sectional view, through *a*—*b*—*c* of Figs. 2 and 3 which are respectively cross sections through **2**—**2** and **3**—**3** of Fig. 1, of the apparatus mounted on a crank. Fig. 4 is a view showing the mounting of the apparatus on a cycle fitted with drum brakes on the hubs. Fig. 5 is a face view of a method of clamping the apparatus onto the crank of the cycle, Figs. 6 and 7 are views folded back on either side, according to Fig. 5.

In said figures, similar digits refer to similar units. **4** is the crank-axle, **5** the crank-axle housing, **6** and **6'** are the tubes of the lower rear fork, **7** the crank positioned on the side opposite to the chain and consequently bearing no sprocket-wheel. A disc **8** provided with two notches **9** is rendered solid with crank **7** by any suitable means. Said disk can rotate freely in direction *d* (Fig. 3) in friction linings **10**—**11**—**12** which surround it and hold it laterally, said linings being themselves retained within housing **13** by bolts **14**. Pawls **15**—**15'** which rotate freely about spindles **16**, solid with **13**, are positioned between said friction linings. Bolts **14** also retain plate **17** which closes casing **13** and supports the two pulleys **18** on which cable **19** can run, and is provided with a lug **20** which can be checked under **6'** to prevent the rotation of casing **13** and of plate **17** in direction *d*.

Pawls **15**—**15'** are contrived so as to drop into notches **9** when crank **7** is in a substantially horizontal position *h* (Fig. 3).

It will be readily understood that when crank **7** rotates in direction *d*, the slight friction of **8** against **10**—**11**—**12** will have a tendency to draw assembly **13**—**17** in the same direction, but that said assembly will be arrested in the position shown owing to the fact that **20** is checked under **6'**, crank **7** continuing to rotate.

On the contrary, in the direction opposite to *d* (back-pedalling), when crank **7** reaches a substantially horizontal position, pawls **15**—**15'** engage with notches **9** which drive them along, as well as assembly **13**—**17** in a direction opposite to *d* which sets up traction on the two ends **19'** and **19''** of cable **19** and consequently actuates the front and rear brakes **21** and **21'** which are respectively connected to **19'** and **19''**, said braking action ceasing as soon as the user pedals in direction *d*. In order that the action of **19'** on **21** may not be influenced by the swivelling movements of the steering assembly, cable **19'** is guided by a flexible sheath **22** clamped on the one hand to the frame at point **23** and to the fork at point **24**.

It will be readily understood that the braking power can be apportioned to brakes **21** and **21'** in accordance with the desired proportions by simply causing a variation in the respective lengths of their operative levers.

Fig. 5 to 7 represent a method of clamping notched disk **8** onto crank **7** of the cycle (and also of ensuring the driving of the disk) by means of a bridge-shaped part straddling the big end of the crank, one branch of said bridge-shaped part being hollowed out to allow the insertion of the key-bolt and the other branch being off set to leave a clear space for the key-bolt nut on the big end of the crank; the centering of the disk and of the crank being ensured by the crank-axle and the clamping of the bridge-shaped part being obtained by means of two nuts bearing against the face of the disk on the side opposite to the crank.

This procures a rapid method of clamping suitable for application to any kind of crank without necessitating any special machining of said cranks and moreover ensuring the positive drive of the disk.

In Fig. 5 to 7, **25** is the bridge-shaped part straddling the crank big end **7**. Branch **26** of

the bridge-shaped part is provided with a hollowed out recess allowing key-bolt **27** to pass through freely, while the other branch **28** is off set to allow nut **29** of the key-bolt **27** to bear directly against the big end of crank **7** and to permit of its being readily tightened up by means of an ordinary open-ended wrench.

Branches **26** and **28** of bridge-shaped part **25** are respectively provided with screw-threaded stud-bolts **30** and **31** which traverse notched disk **8**, and nuts **32** and **33** of which make it possible to apply notched disk **8** firmly against the big end of crank **7**, while said parts are centered to one another by means of crank-axle **4**.

It will be readily understood that the power applied to crank **7** is transmitted to notched disk **8** in the back-pedalling direction (the direction reverse to direction *d*) through branch **26** and stud-bolt **30** whereas, in the pedalling direction there is no appreciable power to be transmitted and the clamping of **7** against **8** is sufficient to ensure the drive.

Obviously the form of embodiment hereinabove described and illustrated is given merely as an example and may vary in a great measure without departing from the spirit and scope of the invention.

MARCEL PAUL DURAND.

PUBLISHED
MAY 18, 1943.
BY A. P. C.

M. P. DURAND
BALANCED CONTROL FOR CYCLE BRAKES
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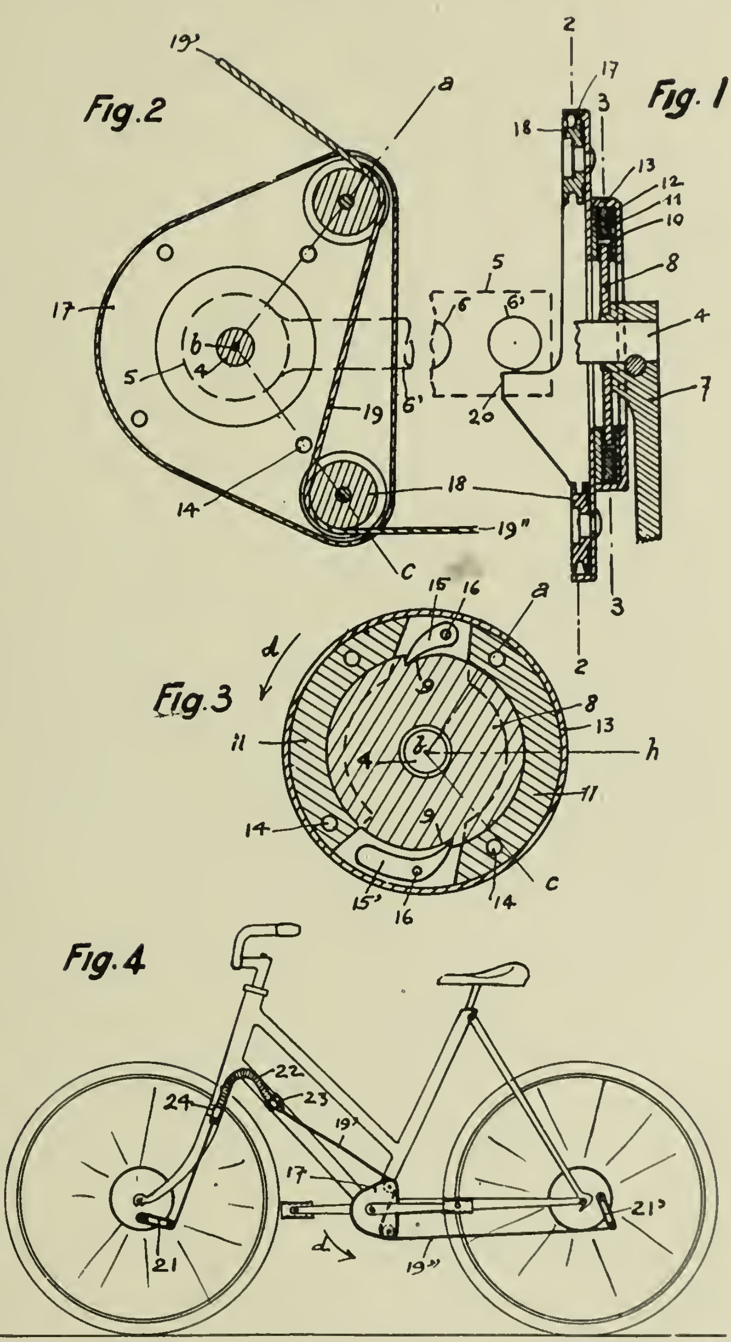
Serial No.
431,207
2 Sheets-Sheet 1



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ATTORNEY

PUBLISHED
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BY A. P. C.

M. P. DURAND
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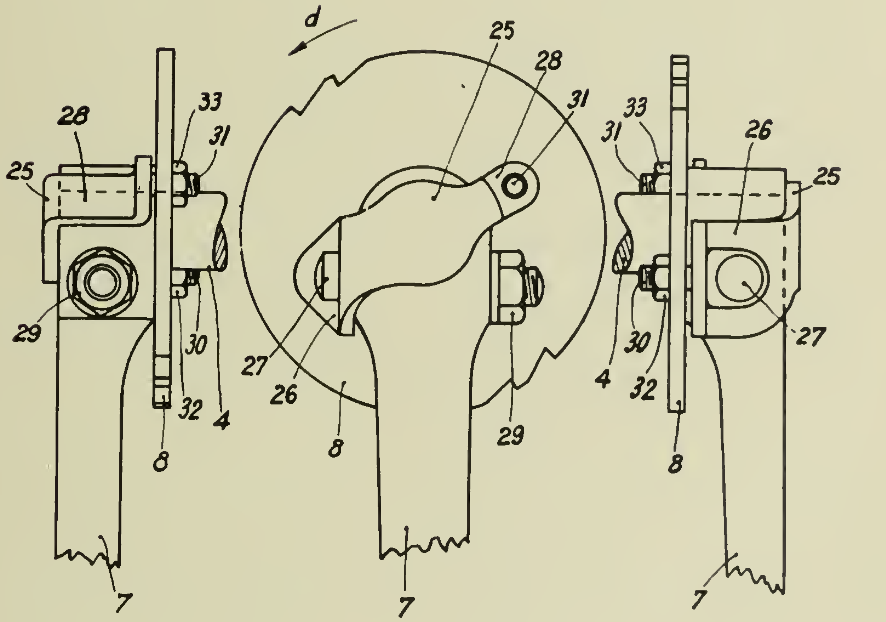
Serial No.
431,207
2 Sheets-Sheet 2

Fig. 6 Fig. 5 Fig. 7



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Published May 18, 1943

Serial No. 431,280

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR THE REVERSAL OF COLOR PHOTOGRAPHIC NEGATIVES

Friedrich Biedermann, Munchen-Unterhaching, Germany; vested in the Alien Property Custodian

Application filed February 17, 1942

My present invention relates to an apparatus for the reversal of color photographic negatives. This application is a continuation-in-part of my application Ser. No. 365,455, filed November 13, 1940 which in turn is a continuation-in-part of my application Ser. No. 327,047, filed March 30, 1940, which in turn is a continuation-in-part of my application Ser. No. 242,627 matured into patent 2,214,072 dated September 10, 1940.

The known apparatus for the reversal of black-white-negatives consist of an image-converting tube which as an essential part exhibits besides a photo- or glow cathode a control electrode provided with a light-sensitive layer. The electrode controls the emission of electrons starting from the cathode so that a certain amount of electrons corresponding to the brightness is removed for each part of the image. Since this amount of electrons does not fall on the fluorescent screen, a negative is hence converted into the corresponding positive.

In order to apply such an apparatus for estimating the adaptability for copying a color negative, it is necessary to register the color value of the color negative to be tested by constantly scanning it with the aid of several filters dyed in certain primary colors.

It is an object of my present invention to provide an improved apparatus for the reversal of color photographic negatives to be estimated by an electric process.

A further object of my invention is to provide such apparatus comprising two similar filter sets dyed in the primary colors and arranged in such a way that filters of the same color are in the beams of light during the same time interval.

A still further object of the invention is to arrange the filter sets in the form of rotatable discs driven by a common synchronous motor.

Other objects of my invention will appear from the detailed description following hereinafter.

Reference is made to the accompanying drawing in which

Figure 1 represents the view of a reversal apparatus according to the invention,

Figures 2 and 3 represent view of filter discs used, and

Figure 4 represents the view of a reversal apparatus and line screens employed therein.

In accordance with my invention two similar filter sets dyed in the primary colors are arranged in such a way that one filter set is positioned between the color negative and the photo-cathode and the other in the path of rays with regard to the observer in such a manner that in scanning the image filters of equal color are simultaneously in the path of rays. Preferably the two filter sets are constructed as rotatable filter discs divided into evenly large filter sectors corresponding to the number of the primary colors. In order to reach a synchronous movement the filter discs are driven by a common motor or two motors synchronously kept in any way. Instead of the rotatable filter discs there may also be used dyed line screens one of which is arranged behind the negative or in front of the photo-cathode and the other on the fluorescent screen. In order to compensate spectral deviations of the light source or of the fluorescent light of the screen suitable filters may be placed in the path of rays. Moreover for removing inaccuracies of color of the negative there may be provided control filters which are also inserted into the path of rays of the copying apparatus in copying the negative.

In Figure 1, a filter disc D mounted on a shaft W driven by the motor M is arranged in the path of the rays emitted by the source of light L and penetrating the color negative N between the lens O and the photo-cathode K. The filter D (Figure 2) consists of three sectors equal in size of angle and dyed in three primary colors as, for instance, yellow (*g*), purple (*p*), and blue-green (*bgr*). A second filter D_1 is in the path of rays of the observer Y in front of the luminescent screen F and is constructed as a disc filter (Figure 3) having three color sectors *g'*, *p'*, and *bgr'* (yellow, purple, blue-green) likewise equal in size of angle in the same manner as the filter D. The filter D_1 is mounted on the shaft W_1 driven by the motor M_1. In order to guarantee a synchronous rotation of the two filter discs they are driven either by a common motor or as shown in Figure 1 by two motors M and M_1 connected with a common network or synchronously kept in any other way. The filters D and D_1 are so positioned in the path of rays that in scanning the image the same filter colors of the both filter discs always are in the path of rays simultaneously. In the example represented in Figures 1–3 the color negative N is illuminated three times during a rotation of the filter discs D, D_1, each time in a primary color. For compensating spectral deviations, for instance, of the source of light L or of the fluorescent light of the screen F a suitable compensating filter *Fi* may be inserted into the path of light. In order to compensate the inaccuracies of color recognized in observing the reversed image of the color negative N, i. e. the color positive on the screen F, control filters *St* may be inserted into the path of rays, for instance, between the filter

disc D and the photo-cathode K. The position of the control filter or filters yields, for instance, the correction of color necessary for the copying of the color negative. The position of the control filter or filters *St* necessary for the best color reproduction may immediately be used for copying by operatively connecting the mechanism for adjusting the control filter with a corresponding correction filter of the color copying apparatus for instance.

Another modification is shown in Figure 4. This apparatus is distinguished from that of Figure 1 by the fact that instead of the filter discs D, D_1, there are employed corresponding line screens Lr, Lr_1, one of which is placed directly in front of the photo-cathode K or behind the negative N and the other on the fluorescent screen F. The screen lines of the screen Lr correspond to those of the screen Lr_1 and are dyed in primary colors as, for instance, yellow, purple, blue-green. Other combinations, as for instance, red, blue, green may of course also be used. In this apparatus compensating filters *Fi* for compensating spectral deviations of the light source L and of the fluorescent light of the screen F and control filters *St* for correcting the color values of the negative may be arranged as already described above as to the apparatus according to Figure 1.

FRIEDRICH BIEDERMANN.

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Fig. 1

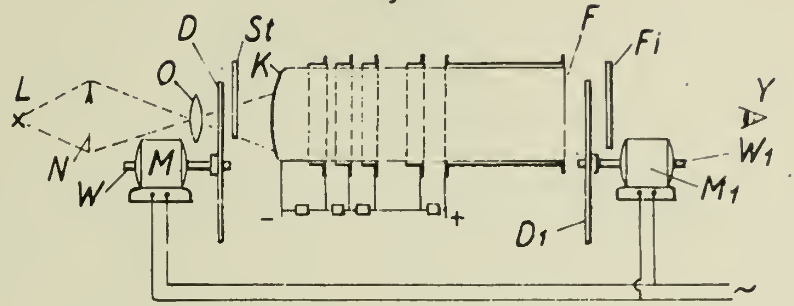


Fig. 2

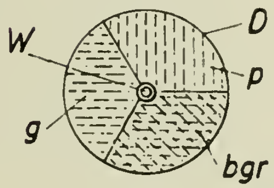


Fig. 3

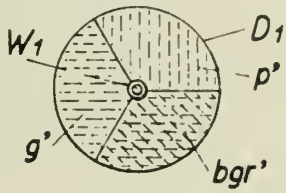
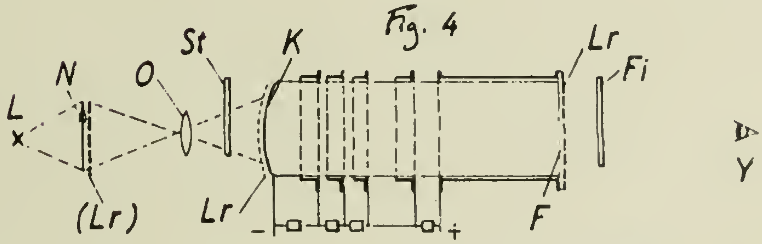


Fig. 4



Friedrich Biedermann
inventor

By Phillip S. Hopkins
Phillip S. Hopkins, attorney

Published May 18, 1943 Serial No. 434,042

ALIEN PROPERTY CUSTODIAN

COMBINED ELECTROMAGNETIC REGULATOR AND SWITCH

Friedrich Menzel, Stuttgart, Germany; vested in the Alien Property Custodian

Application filed March 10, 1942

The invention relates to combined electromagnetic regulator and switches for controlling electric circuits, and more particularly adapted for use in connection with battery-charging generators especially on vehicles.

In order to obtain a good utilization of the magnet core for three armatures a transverse piece is arranged, according to the invention, on the magnet core so that the one part of the magnet core influences one of the armatures, the other part of the magnet core the second armature and the whole magnet core the third armature. The advantage is hereby attained to obtain three different paths of the magnetic flux of which one can be used for a voltage regulator, the second for a current regulator or for a control regulator and the third for a charging switch.

Two embodiments of the invention are illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows a regulator switch arrangement with a voltage coil and a current coil and

Fig. 2 a regulator switch arrangement with a voltage coil, a current coil and an auxiliary coil.

The regulator switch arrangement shown in Fig. 1 comprises a magnet core 1 with a pressure coil 2 and a current coil 3, between which a transverse piece 4 is mounted on the magnet core 1. The magnet core 1 is arranged on a base plate 5 of a magnet frame 5, 6, 7, on the upwardly extending arm 6 of which an armature 8 is suspended. The transverse piece 4 is equipped with an upwardly extending arm 9 on the end of which an insulated armature 10 is suspended. On the arm 9 of the transverse piece 4 an armature 11 is suspended insulated. The two armatures 10 and 11 are connected by a wiring 12.

The armature 8 belongs to its automatic charging switch and carries a contact spring 13, the contact 14 of said spring co-operating with a contact 15. The contact 15 is connected to a battery 16. The armature 10 belongs to a voltage regulator and carries a contact spring 17, the contact 18 of which co-operates with a contact 19 laid on mass. The armature 11 belongs to a current regulator and carries a contact 20, which co-operates with a contact 21. A dynamo 22 has a field winding 23 and a field resistance 24, between which the wire 25 is connected which leads to the contact 21.

The line of force flux of the charging switch extends through the whole magnet core 1, the right hand half of the base plate 5, the arm 6 and the armature 8. The line of force flux of the voltage regulator extends through the upper part of the magnet core 1, the transverse piece 4, the arm 9 and the armature 10. The line of force flux of the current regulator extends through the lower part of the magnet core 1, the left hand half of the base plate 5, the extension piece 7 of the magnet frame and the armature 11. The line of force fluxes of the voltage regulator and of the current regulator use both the transverse piece 4 without impairing thereby the operation of the two regulators.

In the switched position shown in the drawing the field resistance 24 is short-circuited by the following connection: wire 25, pair of contacts 21, 20, armature 11, wire 12, armature 10, pair of contacts 18, 19, mass. When the dynamo 22 produces sufficient voltage, the armature 8 is attracted and closes the pair of contacts 14, 15, whereby the following circuit is closed: mass, dynamo 22, current coil 3, magnet frame 5, 6, armature 8, contact spring 13, pair of contacts 14, 15, battery 16, mass. The battery 16 is charged from the dynamo 22. If at low number of revolutions of the dynamo 22 a return current flows from the battery 16 to the dynamo 22, the charging switch opens its pair of contacts 14, 15 under the influence of the return current flowing through the current coil 3.

If after the closing of the charging switch, the voltage produced by the dynamo 22 rises to beyond a certain amount, the armature 10 is attracted under the influence of the voltage coil 2 and opens the pair of contacts 18, 19. The resistance 24 becomes thereby effective in the circuit of the field winding 23. The voltage regulator begins to regulate to uniform voltage by periodical switching-in and cutting-out of the field resistance 24.

At a predetermined current intensity the armature 11 is attracted under the influence of the current coil 3 and opens the pair of contacts 20, 21. Thereby the resistance 24 in the circuit of the field winding 23 becomes also effective. The current regulator regulates by periodical switching-in and cutting-out of the field resistance 24 to rapidly decreasing voltage of the dynamo 22, so that an overloading of the dynamo 22 by high discharge of current is prevented.

As can be seen from the drawing the transverse piece 4 with the extension arm 9 and the magnet frame 5, 6 are of L-shape, the magnet core 1 being arranged as well perpendicularly to the transverse piece 4 as also to the base plate 5. The two armatures 8 and 10 of for instance rectangular form are arranged at the ends of the upwardly extending arms 6 and 9 and one arm of each of the ar-

matures extends by one half over the attracting surface of the magnet core 1. One arm of the armature 11, which is for instance also of rectangular shape, extends approximately parallel to the transverse piece 4 and its other arm is opposite to the attracting surface of the magnet frame formed by the extension piece 7. The construction of the magnet frame 5, 6, 7 and the arrangement of the three armatures 8, 10 and 11 enable a compact construction of the two regulators and of the charging switch. On the magnet core 1 only two coils 2 and 3 are arranged which influence the voltage regulator, the current regulator and the charging switch in a practical manner.

The regulator switching arrangement shown in Fig. 2 is essentially of the same construction as the arrangement shown in Fig. 1 and differs chiefly by the arrangement of an other coil on the magnet core and by a different manner of operation of the two regulators.

On the part of the magnet core 1 co-ordinated to the voltage regulator and situated above the transverse piece 4 there is arranged, besides the voltage coil 2, a current coil 26. The armature 11, which in this instance is not suspended insulated comprises a contact 27 which cooperates with a contact 28, to which one of the ends of the current coil 26 is connected. The armature 11 controls the current coil 26 and forms consequently a control regulator. The armature 10 of the voltage regulator, suspended insulated, is connected to a wire 29 branching off between the field winding 23 and the field resistance 24. The contact 18 on the armature 10 of the voltage regulator can oscillate between the contact 19 and a contact 30 mounted on the arm 9 of the transverse piece 4.

The armature 10 of the voltage regulator regulates the voltage of the dynamo by periodical switching-in and short-circuiting of the field resistance 24 or by periodical short-circuiting and switching-in of the field winding 23. Up to a certain current intensity it is regulated to uniform voltage. When this certain voltage is exceeded, the armature 11 of the control regulator is attracted under the influence of the current coil 3 and closes the pair of contacts 27, 28, whereby the current coil 26 is switched parallel to the current coil 23. The voltage regulator is then influenced as well by the voltage coil 2 as also by the current coil 26 and consequently regulates then the dynamo 22 to decreasing voltage. The dynamo 22 is thus protected against stressing by too high current delivery. At high currents the voltage of the dynamo 22 does not drop so rapidly owing to this regulation as it is the case in the arrangement shown in Fig. 1, so that the dynamo is better utilized.

Instead of the current coil 26 a voltage coil may be provided on the upper part of the magnet core, this voltage coil being arranged parallel to the voltage coil 2 and the circuit of the same is switched-in and cut-out by the contacts 27, 28 of the control regulator.

FRIEDRICH MENZEL.

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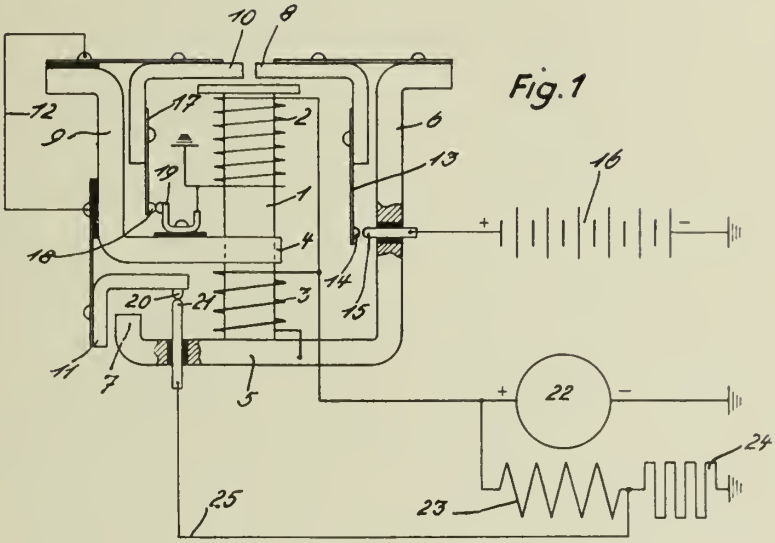

Fig. 1

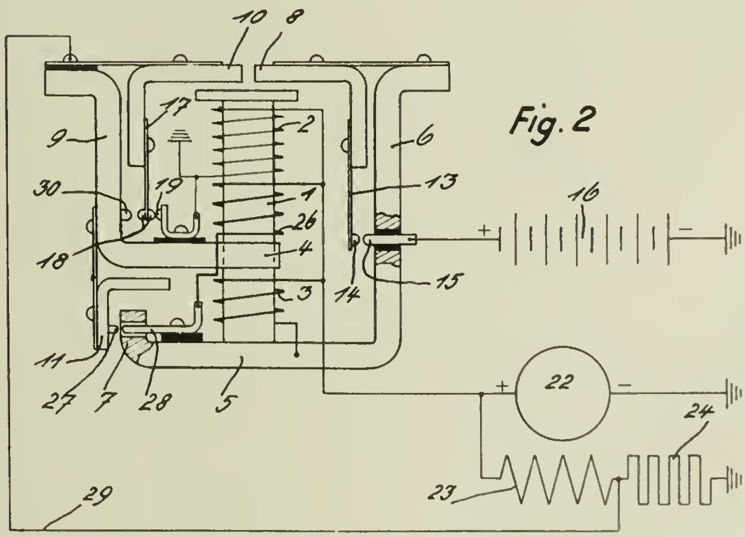

Fig. 2

Inventor
Friedrich Menzel

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his Attorney

Published May 18, 1943

Serial No. 439,590

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE MANUFACTURE OF IMPROVED OILS, PARTICULARLY SUCH AS ARE STABLE DURING STORAGE AND AT INCREASED TEMPERATURE

Friedrich Schick, Berlin-Schoeneberg, Germany; vested in the Alien Property Custodian

No Drawing. Application filed April 18, 1942

In the utilisation of mineral oils it is often necessary to mix different hydrocarbon oils. For instance, it is customary to adjust the properties of commercial oils to the specific requirements of the respective use by mixing oils of different origin. Furthermore, in order to improve the quality of oils which are not per se high-grade oils, it has been proposed to blend such oils with paraffinic or more saturated hydrocarbon oils.

Some oils have been found not to be readily miscible with each other. Gradually, as time goes on during storing or use or under the action of heat, separations are formed in such mixtures to a larger or smaller extent. Blended motor oils show for instance formation of sediments, of carbon and coke, causing clogging of injector nozzles; blended lubricating oils show an unexpectedly high ageing tendency and sludge formation. Not always the sediments may be seen macroscopically; often they are recognized only by giving bad results in tests, or they appear as inhomogeneous components when testing the oils by optical means.

On the one hand it was suggested to blend only oils with similar physical properties, e. g. with a definite range of densities, and on the other hand it has been endeavoured to improve the miscibility or the quality of the mixture by refining the components most intensively. But the first mentioned measure limits considerably the number of utilisable oils and the second one causes a considerable loss of oil, apart from the necessary high consumption of refining agents. It is well known that by intensive treatment of individual oils with sulphuric acid, valuable components of the oil, such as unsaturated components of motor fuel oils and naphthenic hydrocarbons and other constituents of importance for the oiliness of lubricating oils, are eliminated or chemically changed. It has also been proposed to employ diluents when treating mineral oils with acids, in order to reduce the viscosity of the mixture, or to diminish the intensity of the reaction.

It now has been found that a surprising improvement of the properties of the mixed oils and the like may be attained in a simple manner, by first blending the initial oils produced as usually by distilling or refining and subsequently separating the impurities as a flocculent precipitate by the action on the oil mixture of an electric field. This may be applied in any suitable form, e. g. by applying electrical discharges, or by electrolysing or kataphorising with direct or alternating current.

The precipitates caused by such treatment are obtained in such a form as is readily separated from the oil.

The improved treatment according to the present invention generally causes a considerable enhancement of the resistance of the oils to ageing. Moreover often an improvement of the color and of the other properties of the oils results as compared with the refining of the individual oils followed by blending.

With the present procedure it is possible to blend oils of good lubricating quality and cold test, such as naphthenic oils, but which do not suffice with regard to some other test, e. g. the viscosity index, with oils unobjectionable in the latter respect, e. g. a highly paraffinic oil, in order to obtain, with a proper after-treatment according to the present invention, a blended or mixed oil satisfactory in every respect.

The present invention which affords the possibility to treat and improve mixtures of oils of a relatively high degree of saturation and oils of a relatively low degree of saturation, has been found to be particularly satisfactory for mixtures of distillates and residual lubricating oils manufactured from German raw oils and from oils of similar character, with Pennsylvanian oils, the so-called Bayonne oils or synthetic lubricating oils produced by Fischer's method, and furthermore for mixtures of distillate oils or such oils as are refined with sulphuric acid, or with raffinates obtained by means of selective solvents, e. g. such as obtained by the process of the U. S. patent application Ser. No. 94,290.

For the refining after mixing according to the present invention the following mixtures may be considered: mixtures of fresh oils with aged ones, of fresh oils with cracked products obtained from said fresh oils, of more refined oils with less refined oils, and in general of oils having relatively high ageing indices with oils having relatively low ageing indices.

A surprisingly high improvement as regards residue formation and ageing tendency is to be observed also when oils already refined but of different boiling ranges are mixed and an electric field is applied to this mixture. This is of importance for instance for the manufacture of the so called two-stroke blends or mixtures. Apparently the effect of this treatment is depending on differences in the quantity of the saturated hydrocarbons contained in the individual fractions. If desired, said mixtures may be decomposed again by distillation after being treated in the indicated manner. Oils are obtained thereby the properties of which advantageously differ

from those of the oils originally used for the preparation of the mixtures.

The process may be also applied to crude or unrefined oils. Such mixtures may be made exclusively from unrefined oils, or even refined oils may be blended with unrefined ones, the novel feature consisting in the possibility of improving oils by first mixing oils of different character and then refining this mixture.

It has already been proposed to precipitate pitch-like particles from tars by adding crude oil and hydrochloric acid for obtaining products that are more ready workable. In such treatment, however, a considerable part of valuable oils is carried down into the precipitate and thus lost. Furthermore, oil containing slight quantities of mineral acids has been admixed with heavy carbonaceous oils to separate the carbon. Finally, the regeneration of old oils has been tried by treating same in the proportion of 1:100 with a refining mixture consisting of fresh oil and sulphuric acid. Otherwise, hitherto Engler-Höfer's view maintained in their book "Das Erdöl" was shared that heterogeneous oils, e. g. Russian and Galician lubricating distillates should not be refined together but individually and that only the finished products should be mixed. However, it now has been found that in a very great number of cases the manufacture of mixed oils can be simplified and improved by treating according to the present invention the mixture of the crude or unrefined oils with refining means. Thus the individual refining of the components may be dispensed with completely or partly. Of course, it is necessary that such oils are combined which differ in their properties in the aforesaid manner, if the indicated improvements both for the refining process itself and for the refining effect in comparison to the treatment of the individual components shall be obtained.

Thus, unrefined distillates of crudes of various origin may be blended with one another, e. g. unrefined distillates of paraffin base oils, such as Pennsylvanian oils with unrefined distillates of mixed-base or asphaltic crudes, such as German oils. One of the two oils to be mixed, suitably the paraffin base oil, which is rich in saturated hydrocarbons and requiring only small quantities of refining agent, may be prerefined, whereafter the produced mixture is subjected to the action of an electric field. It has also turned out well to pre-treat with bleaching earth one of said oils to be mixed. For this purpose, too, the paraffin base oils are particularly suitable. Similarly, mixtures of lubricating distillates with residual oils may be produced in a condition satisfying all requirements of a first class oil for motor cars. In this latter case it is often to advantage to free the residual oil of at least part of its asphalt content by treating it with a precipitating agent such as propane, alcohols and the like, before mixing or blending said residual oil with the other component.

The present process is principally intended for the treatment of oils of predominately aliphatic character.

The process has proved of special value for manufacturing mixed lubricating oils which are unobjectionable in use, from crude distillates or residual oils, e. g. such of German origin, with synthetic oils such as for instance obtained by the process of Fischer and Tropsch.

The present process is principally intended for the manufacture of lubricating oils.

The present process, however, is of considerable importance also for the manufacture of mixed motor fuel oils preferably of Diesel fuels. It is already known to free tar oils from asphalt and other sediment forming components by mixing same with gas oil from petroleum or with the product known under the trade-mark "Kogasin" (a synthetic motor fuel from the Fischer process), and distilling the obtained mixture, if necessary under pressure. But in a distillation process it is unavoidable, especially as the conditions of solubility in the heat differ from those in the cold, that part of the components to be separated is carried over into the distillate mechanically or in the form of azeotropic mixtures and afterwards causes inconveniences during use. On the other hand oils mostly undergo a chemical change during their distillation, causing the formation of much polymerisate or even coke. Since, however, it is rarely, if ever, possible to obtain all the suitable oil as a distillate, with the known process a larger or smaller production of poor residual oil must be accounted for. All these disadvantages are avoided by the treatment according to the present invention. For instance highly saturated petroleum-gas-oils, hydrogenated products or synthetic gas-oils may be treated in mixture with light lignite-tar-oils, cracking products and the like. If the oils show a strong tendency for the formation of sediments, it is advisable to distill the motor fuel mixture after refining.

The possibility to operate without artificial heat supply when using the new process affords simultaneously the advantage that any detrimental actions of such heating on the oils are prevented.

The present process has nothing to do with the known methods of de-asphalting crudes or fractions thereof with precipitating agents such as low boiling hydrocarbons, alcohol mixtures and so on. The latter act chiefly on the asphalts and asphaltic resins readily separable, whereas considerable quantities of tar- and sludge-forming substances remain in the oil in a state of a more or less stable distribution. The new process, on the contrary, is specially intended for the removal of these components particularly detrimental to the use of the oil. These may be diminished, it is true, by the usual refining methods but they cannot be eliminated completely by them without injury to the oil or at least without losses of valuable oil components.

Oil mixtures showing a strong tendency to separation may to advantage be subjected to a preliminary purification by settling or centrifuging before the refining agent is added.

In a corresponding manner one may stabilise mixtures of lignite-tar light oils, if desired after having previously decreosotised them, with synthetic gas-oil or of marine fuel oil from lignite tar with petroleum gas-oil, and so on.

FRIEDRICH SCHICK.

Published May 18, 1943 Serial No. 439,904

ALIEN PROPERTY CUSTODIAN

METHOD AND APPLIANCE FOR CURVE DISTORTION OF ALTERNATING CURRENTS

Pierre Brieout, Senlis (Oise), France; vested in the Alien Property Custodian

Application filed April 21, 1942

As is well known, the sinusoidal shape which it is sought to impart to intensity and tension curves of alternating currents presents great advantages in most cases though not being the most favorable one for certain predetermined uses of these currents. Thus in particular the use of tension or intensity curves having outlines alike that of a trapezium makes it possible to lessen flickering of such lamps as are fed by very low frequency alternating currents and to obtain a practically direct current merely by rectifying with the aid of dry or other cells a system of three-phase currents having the cited shape. As it is generally desirable that alternating currents should remain sinusoidal throughout the major portion of the distribution network (for example a power transmission line or a line feeding a revolving field motor) it will be seen that it is necessary to modify or distort the shape of the tension and intensity curves only over a well defined portion of the distribution. Obviously such distortion should be such as to be automatically practicable without requiring machines calling for undue upkeep or supervision and to have a high degree of efficiency.

An object of the present invention is to provide a new or improved method by means of which the tension or intensity curve of alternating currents may be imparted a shape similar to a trapezium shape, thereby obviating the aforesaid disadvantages and particularly light flickering in the case of lamps fed by low frequency alternating current.

Another object of the invention is to provide a method as aforesaid owing to which tension fluctuations may be considerably reduced whereby from a three-phase rectifier may be obtained as constant a current tension as that furnished by a six-phase rectifier of the usual type.

A further object of the invention is to provide a method as aforesaid enabling in alternating current networks three-six-phase transformers to be omitted and superseded by a harmonic generator having only one sixteenth of the power formerly needed, thereby greatly saving in iron and leads.

A further object of the invention is to provide a method as aforesaid enabling in this type of installations a saving of approximately fifty five per cent in the number of rectifier dry cells to be achieved, said saving being ascribable to a reduction in the number of phases where a rectifier is used.

A further object of the invention is to provide a method as aforesaid by means of which entirely automatic electrostatic chargers may be realized, these providing for accumulator batteries a steady charging rate without detrimental overloads.

A still further object of the invention is to provide an improved appliance for carrying out the aforesaid novel method, said appliance being readily adaptable to existing plants and making it possible amongst other advantages to derive from alternating currents modified currents having such a substantially constant instantaneous intensity as to become almost direct currents, thereby being utilisable for feeding D. C. motors, for charging batteries and for similar applications.

With these and such other objects in view as will incidentally appear hereinafter, the invention comprises the novel features and combination of features and steps that will now be set forth with reference to the accompanying diagrammatic drawings exemplifying its applications to three-phase and one-phase current distributions and forming a part of the present disclosure.

In the drawings:

Figure 1 is a view showing the curve of a sinusoidal wave provided with a third harmonic in relative amplitude phase $A=\frac{1}{3}$.

Figure 2 is a view showing the curves illustrating the shining power of the zigzag-shaped filament of a 40 watt lamp, said filament being supported in vacuum and fed with sinusoidal current and with undulatory current respectively.

Figures 3 and 4 are views showing two different wiring diagrams for three-phase current distributing plants.

Figure 5 is a view showing a wiring diagram for a plant adapted to feed a three-phase rectifier.

Figure 6 is a view showing curves respectively setting forth a sinusoidal current feed and an undulatory current feed.

Figure 7 is a view showing a wiring diagram for a plant adaptable to a one-phase current network.

Like reference characters designate like parts throughout the several views.

Before proceeding with a detailed description of the figures, it may be stated, generally speaking, that the method according to the invention consists in realizing a tension or intensity curve having a shape approximating that of a trapesium by superimposing to the sinusoidal curves which require to be modified a third harmonic in phase with the sinusoidal function to be modified.

Assuming, as an algebric illustration of the foregoing, $A \sin\omega t$ to designate the original sinusoidal tension or intensity, then the tension or intensity when modified by the present method will be expressed by a formula of the following form: $A \sin\omega t + B \sin (B3\omega t + \theta)$ wherein B/A has a value which is dependent upon the kind of contemplated use, said value being generally comprised between .2 and .4, while the phase angle θ which is theoretically equal to zero should not in practical embodiment exceed a few degrees.

The appliance for producing and superimposing the third harmonic with the suitable phase comprises in all embodiments: in combination, saturated choke or reactance coils and a so-called injection transformer whose secondary winding is so interposed in the distribution leads as to inject thereinto such harmonic components as to periodically take and give energy.

Such an appliance will of course vary depending upon whether a three-phase current curve or a one-phase current curve must be distorted.

Where three-phase currents have to be delivered by a network comprising a middle or "neutral" lead, the appliance will comprise three saturated choke or reactance coils respectively connected to the three phases and to a common point so as to provide a compensation of the basic component, and an injection transformer whose primary winding is connected on the one side to the common point of the saturated coils and on the other side to the neutral point of the distribution, while its secondary winding is inserted in the proper direction intermediate the ends of the neutral lead.

This arrangement affords among other advantages that of lowering the flickering of electric bulbs or lamps to such an extent that due regard being paid to the known sensorial persistence on the eye retina, such flickering is no longer perceived by the eye and the ensuing strain is obviated. A concomitant advantage of this arrangement is that lamps thus fed then receive electric current whose curve has the aforesaid outline and materially lessens temperature variations and shining intensity fluctuations of the glowing filament in the course of a cycle.

When a system of three-phase tensions having the aforesaid curve shape is applied to a three-phase rectifier made up preferably of dry or like cells having one-sided conductivity and as low a reactance as possible, the provision is afforded by suitably regulating the amplitude of harmonic tension to obtain almost continuous, i. e. direct current which can be used for feeding motors, loading batteries and more generally for all purposes requiring currents whose instantaneous intensity is substantially constant.

The insertion of the so-called injection transformer in the middle or neutral lead allows currents having the aforesaid curve outline to flow only through apparatus connected across the phase and neutral leads such as lamps, rectifiers or the like wherein such currents have a useful effect since they are practically always subjected to simple sinusoidal tensions. Conversely, motors connected across phase leads are not fed by distorted currents since this would present no useful purpose.

An appliance for carrying out the novel method in the case of one-phase alternating current distribution comprises a so-called injection transformer whose secondary winding is tapped to the delivery circuit while its two primary windings respectively receive current from a saturated choke coil and current from a choke coil having a slightly varying inductance, whereby the basic component fluxes annihilate each other.

It will be seen from the foregoing that in all contemplated uses of the novel method, the latter comprises three simultaneous operations as follows:

1°—Obtaining by means of saturated choke coils fed by the sinusoidal tension which must be distorted currents having a so-called basic component and the same frequency as the feeding tension and a harmonic tension of triple frequency in phase opposition to the first-named tension.

2°—Cancelling basic components or their effects either by a direct compensation in the case of three-phase currents or by annihilating their fluxes by an equal and oppositely directed flux in the case of simple alternating current.

3°—Adding harmonic components (in phase where three-phase currents are dealt with) and injecting said components into the distribution network through a so-called injection transformer whose secondary winding is interconnected to the network.

Reference being now had to the accompanying drawings which will allow of a complete understanding of the invention, there is shown in Fig. 3 a lighting network generally designated by 2 and fed by a sinusoidal electromotive current the frequency of which is equal to say 25 cycles. The problem to be solved according to the invention is to improve the curve characteristics of the current which flows through said network. To that effect, there is superimposed to the above-cited frequency a sinusoidal tension having a frequency connoted by the figure 75 and such an amplitude and phase that where a non-reactive circuit such as a lamp circuit is fed, the intensity should comprise a third harmonic in phase with the basic tension and a relative amplitude equal to say ⅓.

The curve plotted on Fig. 1 brings out, in terms of time, the undulatory feeding tension once the method according to the invention has been applied thereto and its efficient value designated by E eff.

The showing of Fig. 2 enables a comparison to be made so far as the "flash" or shining power (reckoned in candle units per square centimeter of glowing filament) curve in terms of time is concerned between a conventional lamp fed by a sinusoidal current (curve 3) and the same lamp fed by an undulatory current (curve 4). This comparison of the two curves shows that the application of the novel method reduces the space between the extreme values of the flash or shining power of the glowing filament.

It is known that the frequency of a sinusoidal current can be trebled by means of a combination of magnetic circuits comprising only stationary parts.

Assuming now the three tensions of a three-phase distribution to be applied to three identical choke coils such as 5, 6, 7 (Fig. 3) there will be obtained in each circuit, provided the number of revolutions of each of the impedances is so selected as to enable the iron saturation to be reached, a pulsating current characterized by the appearance of strong alternated current impulses separated by time intervals during which the intensity remains relatively weak. Now to one and the same circuit may be algebrically added the current impulses from the three choke coils by causing the currents from each coil to flow through identical windings 8, 9, 10 arranged on the magnetic circuit of a non-saturated trans-

former 11. The electromotive force generated in the secondary circuit 12 of the injection transformer will have a frequency equal to three times that of the basic three-phase currents.

This electromotive force whose phase is servo-controlled by the three-phase tension is injected or input to the neutral lead 13 of the lighting network 2 which it is the purpose of the novel method to improve by inserting thereto the secondary winding 12 of the transformer 11.

Such an appliance which, as will be understood, is a sheer electromagnetic device obviously requires neither maintenance nor supervision and can operate for a very prolonged duration without any overhaul.

The shunting of the primary windings 8, 9, 10 by condensers such as shown at 15, 16, 17 improves the setting into phase under full load and for unbalanced rates of operation.

Safety devices may be provided for passing from undulatory current over to sinusoidal current or vice versa with the utmost easiness. To that effect, all that is needed is to short-circuit the secondary winding of the so-called injection transformer and to cut the choke coils off any feeding tension. Such results may be obtained by means of a three-pole switch 18 for the choke coils and a one-pole switch 19 for the short circuit.

The starting and stopping of the harmonic generator may be effected also at any suitable time and without requiring any special precautionary step by means of a hand operated switch 20 or a switch clock or equivalent time switch 21. A master switch 22 is provided for rendering the clock 21 inoperative and switching in the harmonic generator at any desired time outside the schedule of uses laid down by the clock.

In order to shelter a plant constructed as above described against the lack of tension on one or two phases of the network or against an undue unbalance in the load, a relay 23 provided for a maximum of tension is tapped across the terminals of the secondary winding and so adjusted as to open the operating circuit for the switches as soon as the tension at said terminals exceeds a predetermined limit and then to close back said circuit when this tension dwindles down to a few volts.

Relays such as 24 and 25 are provided to enable an automatic control of the three-phase switch 18 and one-pole switch 19 which, when inoperative, assume those positions shown in Fig. 3 or reverse positions when a static trebler operates.

Moreover, the plant may be protected from such an accident as might eventually happen, however improbable this may seem, should a short circuit occur inside or between the terminals of the injection transformer. This protection may be performed by three cut out fuses such as 26, 27, 28 mounted in series with each of the choke coils.

Where the lighting network is constituted by a plant owned by a subscriber to the electricity company, it is advantageous to substitute for the time switch 21 a three-phase relay 29 capable of automatically connecting in series the harmonic generator as soon as the load reaches a predetermined value and of bringing the same back to inoperative condition when the power absorbed by the plant dwindles down below a given limit or even to zero.

A modification of the appliance for carrying out the novel method as applied to a three-phase current distribution may be built on the basis of the following observation:—Since the total of basic frequency components of the currents flowing through the saturated choke or reactance coils is equal to zero at every instant, it is not necessary for them to be impressed to the primary windings of the injection transformer, whereby such components may be cancelled by a direct adding process consisting in interconnecting the ends of the choke coils oppositely located to the feeding network. Beyond such interconnection, i. e. through the primary winding of the injection transformer only flow under such conditions those harmonic components of the coil currents whose order is a multiple of 3 and particularly the third harmonics produced by saturation of the iron. These become mutually added inside the primary winding of the injection transformer which, in this case, may be simple and may have its output connected to the neutral lead of the distribution. The secondary winding is then chiefly traversed by a harmonic electromotive force having a frequency three times as large as the basic current and capable of being set into phase with the latter, by suitably selecting the direction of the windings. As the primary winding of the injection transformer is no longer traversed by the basic components of the choke coil currents, there is secured amongst other advantages a substantial reduction of losses by reason of the so-called Joule action as well as an increase of the power and efficiency of the appliance.

The constructional form shown in Fig. 4 comprises three saturated choke coils 5, 6, 7 having one end of their winding connected respectively to each phase of a three-phase current distributing network 2. The three other ends are jointly connected at 33 to the neutral lead 13 of the distribution wiring through the primary winding 34 of the injection transformer, said winding being of the simple type.

The basic components of those currents which flow through the choke coils 5, 6, 7 are mutually compensated by adding at each moment at the point 33, and the components corresponding to the harmonics whose order is a multiple of 3 and particularly to the third harmonic are added in the primary winding of the injection transformer whose secondary winding 35 is inserted in the neutral lead of the distribution. It will be easily seen that through said winding can flow only harmonic components whose order is a multiple of 3.

This method of lessening the flickering of electric lamps presents amongst other advantages the following ones:—

(*a*) The power of the harmonic current generator can be increased.

(*b*) The losses arising from the generator are diminished.

(*c*) A conventional auto-transformer may be used as an injection transformer, this involving a saving in purchasing cost.

(*d*) Correct operation may be secured even on widely unbalanced networks.

As a matter of course, all safety and control contrivances diagrammatically shown in Fig. 3 may be applied to the modification which has just been described in connection with three-phase currents. Such contrivances have been purposely omitted from Fig. 4 for the sake of clearness of the general illustration.

Should the method be applied to a three-phase current rectifier, the three leads 51, 52, 53 (Fig. 5) of a three-phase distribution wiring including

a neutral lead feed, on the one hand, the saturated choke coils 5, 6, 7 and the injection transformer 34—35 of a harmonic generator and, on the other hand, the elements 9, 10, 11 of a three-phase rectifier whose common point 57 is connected through the current-utilising apparatus 58 to the end of the winding 35 which belongs to the injection transformer.

The current-utilising apparatus 58 may be for example a battery, a D. C. motor or any other electrically fed or controlled apparatus.

The rectifier circuits are subjected to three-phase undulatory tensions which, after being rectified, create at the terminals of the current-utilising apparatus a substantially constant tension. The best results can be obtained when the amplitude of the third harmonic injected into the distribution is substantially equal to one fourth of the three-phase tension amplitude.

Owing to this arrangement, the power of the harmonic current is equal to one sixteenth only of the power spent in the utilising circuit. Power consumption for creating the harmonic is therefore quite small and is made good (losses being deducted) in the utilising circuit. As a result of this, the conversion of sinusoidal currents into undulatory currents involves a high degree of efficiency which may reach 97%.

In Fig. 6, the curve 59 represents the tension variation, in terms of time, of a three-phase rectifier fed by sinusoidal current. In this figure, the curve 60 is concerned with the tension of the same rectifier when fed by undulatory currents as above stated. In this last-named case, the tension fluctuations do not exceed those obtained from a six-phase rectifier fed by a sinusoidal current.

It is noteworthy that the tension represented by the crest of the curve 60 is lower by about 10% than that shown by the curve 59. Accordingly assuming dry rectifiers comprising multiple elements to be used, the number of elements per phase may be reduced by 10%. As on the whole an equivalent result is obtained to that which a rectifier involving twice as many phases would give in sinusoidal, it will be seen that a total saving of 55% is secured over the full number of the rectifying elements.

Moreover, as the harmonic tension as supplied by the plant increases when the intensity decreases, the peak or crest tension of the rectified current increases simultaneously to the increase of the counter-electromotive power of the battery being loaded. This makes it possible, by suitably sizing the several parts of the appliance, to construct an entirely automatic static charger providing for a reasonable load without any detrimental overload.

It will be understood that the improved method can be applied to any industrial frequency and that the conventional or known arrangements of choke coils and condensers for reducing tension fluctuations may be adapted thereto.

The chief advantages to be derived therefrom are consequently as follows:

(*a*) Tension fluctuations are largely reduced so that from a three-phase rectifier may be derived a tension that will be substantially as constant as the one furnished by a usual six-phase rectifier.

(*b*) A three-six-phase transformer may be done away with and replaced by a harmonic generator having one sixteenth of its power, thereby enabling a saving in iron and leads to be achieved.

(*c*) An economy of 55% on the number of the dry rectifier elements is secured due to the fact that the phase number is lessened when utilising the improved method.

(*d*) The possibility is afforded of building entirely automatic chargers capable of supplying batteries with a reasonable load without detrimental overloads.

The difference between the wiring diagrams shown in Figs. 3 and 5 resides in the following facts: In the wiring shown in Fig. 3, the cancellation of the basic components of the currents which flow through the saturated choke coils is obtained by adding together the fluxes produced by the latter through the magnetic circuit of the injection transformer. In fact, the basic components of the fluxes from the three choke coils have a total equal to zero, while the harmonic components of these fluxes are mutually in phase and are added to one another.

In the wiring diagram shown in Fig. 5, the outputs of the three choke coils are directly connected to a common point which coincides with the input terminal of the injection transformer, whereby a direct compensation of the basic components of the currents and the addition of the harmonic components may be performed at said point. An advantage of this arrangement lies in the fact that in the primary winding of the injection transformer now only flow harmonic currents, thereby lessening losses in the iron and copper parts and ensuring the generator higher efficiency.

Where one-phase current is used, the wiring diagram as shown in Fig. 7 may be adopted with particular advantage. The current containing the third harmonic is generated in a saturated choke coil 40 comprising a closed magnetic circuit to which is applied the sinusoidal tension to be corrected which feeds a lighting network 41. Simultaneously there is generated in an ironless choke coil or in a choke coil 42 having a constant or hardly varying inductance such an intensity as will have a basic frequency and an amplitude comparable to the one which flows through the coil 42. Both intensities circulate in reverse directions through the primary winding 43 of the injection transformer and are so regulated as to cause their fluxes to mutually compensate each other.

The resultant flux is therefore solely constituted by the flux from the third harmonic which induces through the secndary winding 44 of the injection transformer such an electromotive power having a trebled frequency as is required for lessening or deleting flickering of the lamps. Correct phasing is given by a suitable selection of the direction in which the winding lead is wound.

In this arrangement, the triple frequency component is always generated in a saturated choke coil. The accompanying basic component is cancelled owing to an inductive action through the primary winding of the injection transformer which comprises two winding regions through which the flows are in reverse directions, namely by the current from the saturated choke coil and by the current from a constant or slightly varying choke coil. It will be seen that this arrangement operates according to the principle of magnetic compensation of the fluxes as above described in connection with three-phase currents.

PIERRE BRICOUT.

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BY A. P. C.

P. BRICOUT
METHOD AND APPLIANCE FOR CURVE DISTORTION
OF ALTERNATING CURRENTS
Filed April 21, 1942

Serial No.
439,904
2 Sheets-Sheet 1

Fig. 1

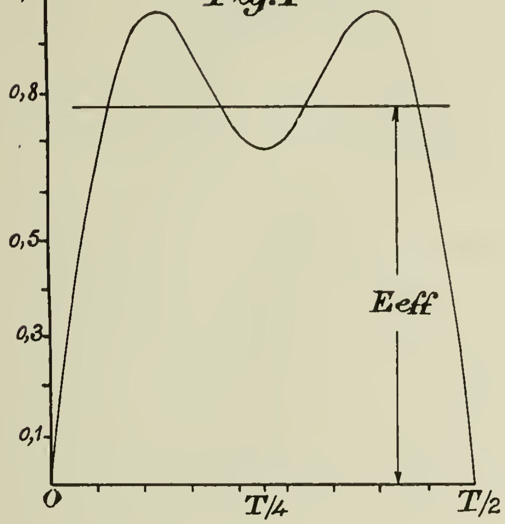


Fig. 7

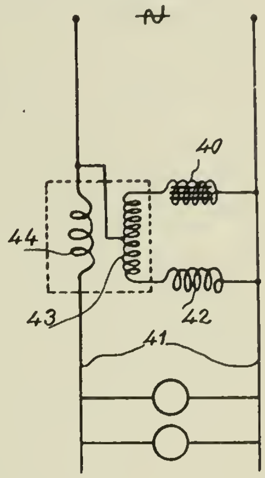


Fig. 4

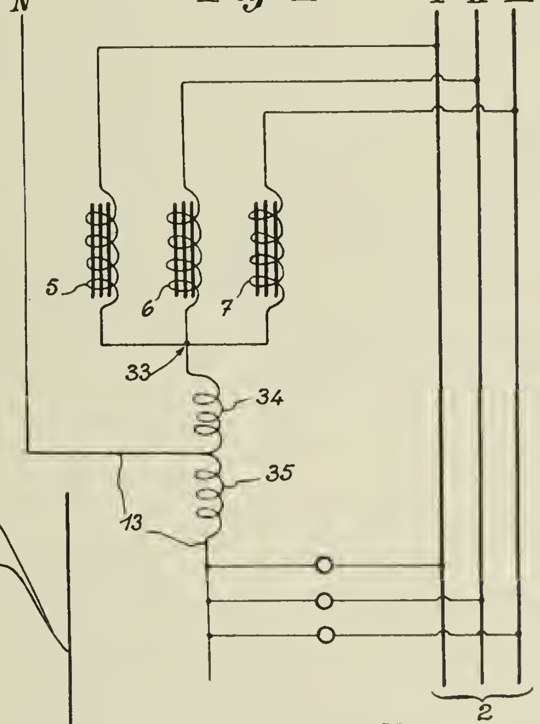
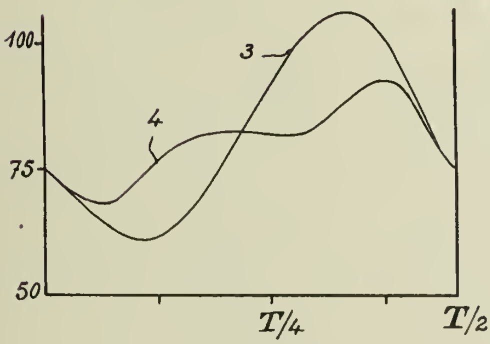


Fig. 2



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2 Sheets-Sheet 2

Fig.3

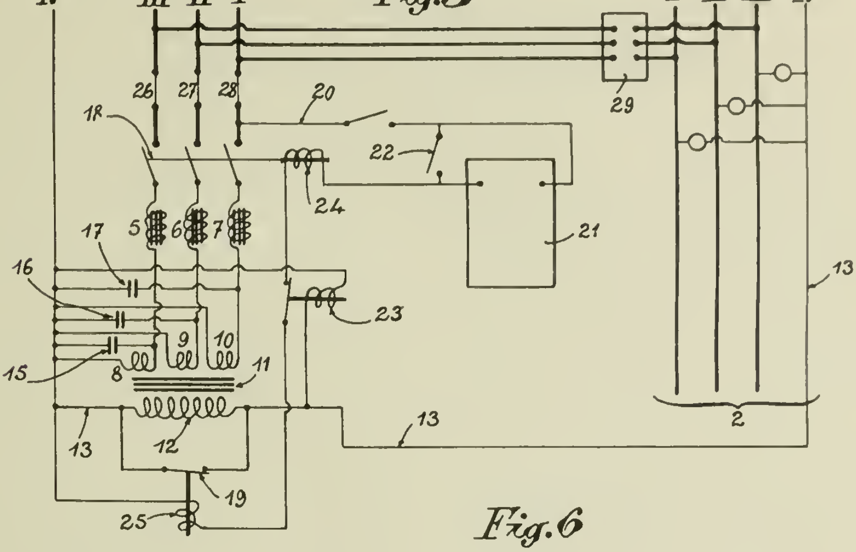


Fig.6

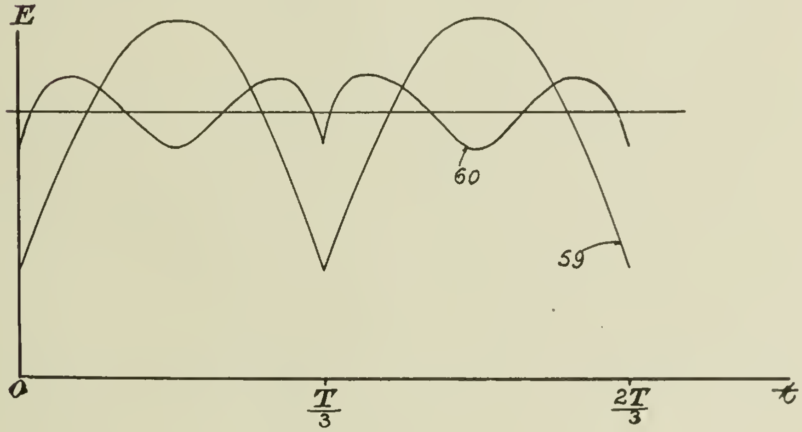
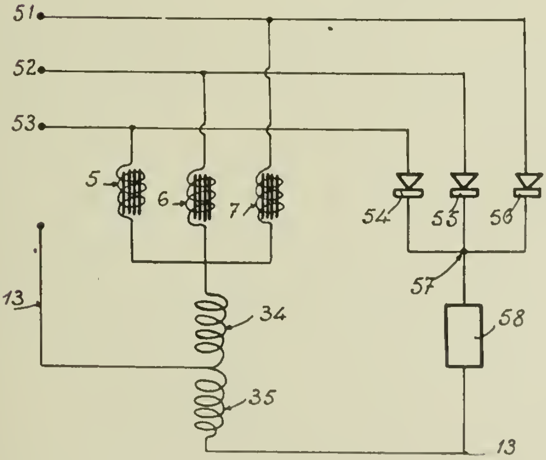


Fig.5



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ALIEN PROPERTY CUSTODIAN

SOUND REPRODUCING UNIT FOR SOUND-FILMS

Jacques Louis Joseph Marette, Saint Germain en Laye, and Henri Louis Burnat, Paris, France; vested in the Alien Property Custodian

Application filed April 22, 1942

The present invention relates to an optical device applicable to sound reproducing units for sound films.

It is known that the reproduction of sound on a film on which is photographically inscribed a sound-track necessitates the use of the following members:

1. A projecting device, which is intended to form on the part of the film occupied by the sound-track, a luminous reproducing line, at right angles to the direction in which the film continuously unwinds.

2. A photo-electric cell, which receives the luminous beam emitted by the preceding device after passing over the sound-track, and which transmits to an amplifying system the electric currents generated by the luminous modulations, said currents thus amplified being then sent to loud-speakers.

Up to now, for allowing the photo-electric cell to receive the totality of the amount of light emitted by the reproducing line, said cell was placed either near the film, or at a more or less great distance therefrom, by using, in this latter case, mirror devices or prisms causing the luminous reproducing beam to follow a broken line, function of the general diagram of the apparatus, so that the light finally falls on the photo-electric cell.

This latter arrangement allows of placing said cell at the most favorable place, as well as regards the technical operation, as concerning the general aspect of the whole of the apparatus.

However, when the light beam must be subjected to a plurality of reflections, a somewhat important complication of the construction and appreciable losses of light result therefrom.

The present invention is intended to give greater facility in carrying out the apparatus, by allowing the light beam to follow, between the film and the cell, any path whatever, broken or curved.

For that purpose and according to the invention, between the sound-track of the film and the photo-electric cell, is interposed a solid or hollow glass block, having polished lateral faces the two terminal faces of said block being perpendicular to the optical axis of the beams passing through them and serving one for the admission, the other for the issue of the light beam, the lateral faces being silvered and arranged in such a manner as to avoid any backward return of the light, so that, apart from the slight losses by absorption or reflection, any amount of light which enters through the inlet face issues entirely through the outlet face.

A simple arrangement consists in using a solid glass cylinder, the two terminal circular bases of which are polished and transparent, whereas the cylindrical portion is polished and silvered, the generatrices of said cylinder having the desired curvature for causing the light to follow the required path.

Use can be made of a prismatic, truncated, pyramidal or like glass block, incurved in the same manner.

It will be seen that with such a device, and provided certain limits are not exceeded, the light beam can be caused to follow any desired path to reach the cell.

This device allows, for instance, in the case of cinematographic sound apparatus, of placing the photo-electric cell at the most favorable place.

In particular, in projectors of under-standard dimensions, in which, owing to the smallness of the images, between the image and the sound only a very small length of film is available resulting from the offsetting of 25 images, it becomes easier to find a place for the sound head by the side of the image projector, whilst maintaining a sufficient space between the members for allowing the easy charging of the apparatus.

Instead of employing, a cylindrical glass block with silvered lateral faces, use can be made of a polished block of transparent material the refractive index of which does not allow the lateral issue of the light rays, such for instance as the synthetic product mainly made of methyl methacrylate, commonly called "plexi-glas."

In the accompanying drawing, which shows, by way of example, an embodiment of the invention:

Fig. 1 is a view in elevation of the sound-reproducing unit according to the invention.

Fig. 2 is a cross section thereof according to line **2—2** of Fig. 1.

Referring to the drawing, it will be seen that A designates a sound-film which, after having passed through the image projecting apparatus **1**, passes around a drum **2** and guiding rollers **3**, **4**. A projection device **5** forms on the sound-track of the film A a luminous reproducing line, which must be received on a photo-electric cell.

According to the invention, said cell **6** is placed at the most convenient place as regards the construction of the apparatus, and between the film and the cell **6** is interposed a glass block **7**, having the features previously described.

In the example illustrated, said block is truncated. Its inlet face *a* and its outlet face *b* are perpendicular to the optical axis of the incident and emergent beams. The axis of the truncated cone is first bent so as to guide the light radially relatively to the drum **2** to inflect it downwardly (Fig. 1) and it is bent a second time to direct the light laterally out of the drum **2**, then towards the photo-electric cell **6**.

Of course, the embodiment illustrated is only given by way of example.

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[illegible]

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SOUND REPRODUCING UNITS FOR SOUND-FILMS

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Serial No.
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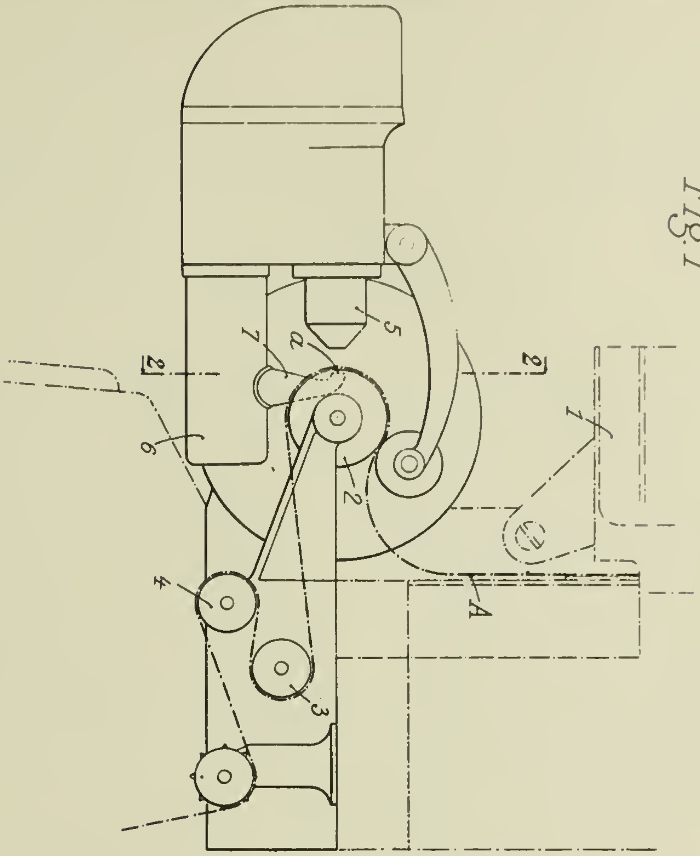

Fig. 1

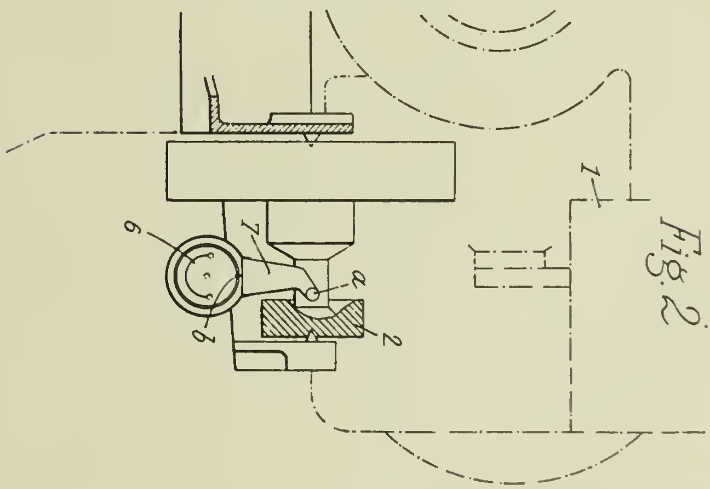

Fig. 2

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their ATT'Y

Published May 18, 1943

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ALIEN PROPERTY CUSTODIAN

BRAKES

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Application filed May 20, 1942

The invention relates to brakes and more particularly to brakes in which the applying means comprises a wedge acting on the brake shoes through the intermediary of a roller and links assembly.

One object of the invention is to provide a brake applying means forming an independent unit, the members of which cannot be separated one from another in spite of the relative movement of said members during the operation of the brake.

Another object of the invention is to provide a brake applying means including a wedge adapted to spread one from another a pair of links operatively connected to the brake shoes while upon release of the brake the return stroke of the wedge brings positively said links to normal position independently of the return of the brake shoes;

A still other object of the invention is to provide a fluid pressure operated cylinder for actuation of the wedge acting on the brake shoes, said cylinder being adapted to be secured to the backing plate in any angular position of the wedge with the bleeding port projecting upwardly, thus enabling an efficient bleeding operation.

Another object of the invention is to provide a brake provided with an adjusting means acting as an anchorage for the brake shoes and in which the adjustment of the anchorage is effected by rotating an eccentred member through which extends a projection of the casing in which is located the adjusting means.

Other objects and advantages of the invention will be apparent from the following description, wherein reference is made to the accompanying drawings, in which:

Figure 1 is a view in section of the improved applying means shown in normal position.

Figure 2 is a view similar to Figure 1 and shows the applying means in a position corresponding to the end of its operating stroke.

Figure 3 is a view of a brake including the applying means shown on Figures 1 and 2, and in which the cover of the casing, in which is located said applying means, is removed.

Figure 4 is a vertical section on line 4—4 of the brake shown in Figure 3.

Figure 5 is a section on line 5—5 of the adjusting means shown in Figure 3, the left hand part of the figure showing the adjusting means in its initial position, while the right hand part of the figure shows the adjusting means in a position which corresponds to the end of its stroke.

Figure 6 is a view of an emergency applying means embodied in the brake shown in Figures 3 and 4.

Figures 7 and 8 are similar to Figures 1 and 2, and show an embodiment of the improved applying means.

Figure 9 is a view of a brake provided with an applying means shown in Figures 7 and 8, and in which the left hand part of the cover carried by the casing enclosing the applying means is removed.

Figure 10 is a vertical section on line 10—10 of the brake shown in Figure 9.

Figure 11 is a section on line II—II of the adjusting means shown in Figure 9, the left hand part of the figure showing the adjusting means in its initial position, while the right hand part of the figure shows the adjusting means in a position which corresponds to the end of its stroke.

Figures 12, 13 and 14 shows positioning means for broke shoe rims.

The brake illustrated in Figures 1 to 6 comprises a backing plate 2 and brake shoes 4 and 6 adapted to be brought into contact with a rotating drum 8 under the control of an applying means indicated generally in 10. The applying means includes a wedge 12 adapted to reciprocate in a plane perpendicular to the backing plate and shown as being integrally made with an operating rod 14 actuated by a fluid pressure responsive cylinder indicated generally in 16. The wedge 12 acts on the brake shoes 4 and 6 through the intermediary of links 18 each formed on its inner end with a short projection 20 and a longer projection 22 between which extend the respective operating faces of the wedge. The links 18 are of identical construction, and the position of these links is inversed on the wedge 12, so that the latter is inserted on each side between a short projection 20 and a longer projection 22. The wedge acts on the links through the intermediary of operating rollers 24 and 26 mounted on pins 28 and 30 which extend through the projections formed on the links.

A pin 32 carried by the wedge projects into a slot 34 formed in the longer projections 22 and arranged in such a manner that the displacement of pin 32 in said slot, upon forward movement of the wedge, is not hindered by the spreading movement of the links operated by said wedge. The slot 34 is formed with an inclined ramp 36 which, on each of the projections 22, is arranged parallel to the operating surface of the wedge acting on the respective link.

In case the brake shoes would, for some reason, fail to return upon release of the brake, the links 18 will positively be brought to normal position by the wedge. As the wedge initiates its return stroke under the action of return spring 38 which takes support on a metal cup 40 carried by the operating rod 14, the pin 32 slides on the inclined ramps 36 provided in the longer projections 22 and thus urges the links 18 to normal position bringing them one closer and closer to the other, until they come into the position shown in Figure 1. The pin 32 is preferably secured to the wedge 12 by means of a cotter pin 42, which takes support on a disk 44 inserted on said pin and resting on the upper side of the wedge.

As illustrated in the drawings, the links 18 may be formed by two stampings of unequal shape defining the shorter projection 20 and the longer projection 22. These stampings can be secured one to the other on their outer ends for instance by spot welding.

The applying means 10 is located in a U-shaped casing designated generally in 46. This casing is secured to the backing plate 2 by means of bolts 48 extending through openings formed in its base and through corresponding openings 50 provided in the backing plate. On the bolts are mounted nuts 52 which, as shown in Figure 1, engage a depression formed in the backing plate and lock the casing in place. The base of the casing is besides formed with a central opening 54 through which extends with play the operating rod 14. The lateral walls of the casing may be formed, as shown in Figure 3, with reinforcing ribs 56 and the edges of these walls may be shaped to provide guides 58 substantially parallel to the backing plate on which move the pins 28 and 30. The marginal portions of the casing walls are bent parallely to the backing plate and in each of said portions there are formed circular openings 60. On the casing 46 is secured a cover 62 the inner face of which acts as a rolling table for supporting rollers 64 mounted in pairs on the pins 28 and 30 extending through the links. The rollers 64 are mounted on opposite sides of the links, preferably with interposition of distance washers 66, and said rollers are kept in place by means of split rings 68 mounted in grooves, formed at the outer ends of the pins 28 and 30. When the wedge 12 effects its forward stroke, the operating rollers 24 actuated by said wedge spread the respective links one from another and the reaction of the wedge is transmitted to the cover 62 through the intermediary of the supporting rollers 64 adapted to roll, in operation, on the inner face of the cover. The latter is provided with marginal bent portions 70 corresponding to the bent portions formed on the cover. In the marginal sections 70, there are provided elongated openings 72, the middle position of which corresponds to that of the openings 60, and bolts 74 extending through these openings serve to secure the cover to the casing. As shown in Figure 4, on the bolts 74 are mounted nuts 76 and the head of these bolts is formed with a flat engaging the casing wall, so that the position of these bolts cannot be altered by vibrations inherent to the motion of the vehicle.

Since the openings 72 formed on the cover are elongated in the longitudinal direction, it is possible, by loosening the nuts 76, to adjust the position of the cover with respect to the casing, thus enabling to proceed with the factory adjustment of the brake intended to compensate the manufacture clearances which are unavoidable in the practice. The cover 62 is formed with a rectangular opening 78 through which extends freely the wedge when the latter has completed its operating stroke, as shown in Figure 2. It will be noted that the wedge 12 is mounted floatingly, so that it can move in either direction. The wedge can thus follow the brake shoes in their displacement and compensate the difference in the wear of the linings mounted on the shoes.

The longer projection 22 is formed with a lug 80 having a shape complementary to that of the adjacent short projection 20 and a suitable play is left between these projections. The outer link ends are formed with slots 82 into which project the webs of the shoes 4 and 6. It will be noted that a play is left between the outer edge of the links and the adjacent wall of the cover, while the inner edge of the links also clears the walls of the casing. Thanks to this arrangement, even in case the links 18 were covered with a layer of rust, no licking effect can take place since the links are suspended in the air.

The outer ends of the links 18 are provided with abutments 84, which take support on the opposite ends of the cover, beyond the plane in which extend the shoe webs, which are connected one to the other by return springs 86 and 88, so that the component resulting from this overhanging effect tends to urge, in normal position, the links, the supporting rollers and their pins, into contact with the cover, to lock them in position, thus avoiding any clicking noise during the motion of the vehicle. When the brake is brought into action, the abutments 84 clear the ends of the cover so that the overhanging effect is suppressed, and the links 18 are therefore enabled to move freely and bring the brake shoes into contact with the drum. The links operating the rollers and the wedge form then an assembly which is alined in one plane, under the action of the load, thus avoiding any wedging effect.

It results from the foregoing that if for some reason, the brake shoes would lag to return to normal position, the links could not become disassembled from the applying means assembly; the interlock between these members is due to the fact that the outward pivoting of the links on the pins 28 and 30 is limited due to the fact that the edges of the links extend closely to the cover 62, while the inward pivoting of the links is limited by engagement of the lug 80 formed on one link with the shorter projection 20 of the other link. The applying means thus forms an independent unit, the members of which are kept in place without any possibility of leaving the unit, in spite of the relative displacement of these members in operation.

The wedge 12 can be manufactured by drop forging and formed on each side with a recess 87 of trapezoidal shape which facilitates the provision of straight surfaces adapted to slide between the forked projections of the links. As shown on Figure 3, in order to eliminate the friction of the basis of the operating rollers 24, 26 on the inner walls of the forked links 18, these rollers are formed with a chamfer 89 on the major part of their basis.

In order that the brake shoes be kept in proper lateral position with respect to the backing plate, there are provided return springs 90 inserted on pins 92 which pass through openings formed in the backing plate and corresponding openings provided in the brake shoe webs. The return springs take support on a metal cup 94 mounted at the end of the pin 90 and on a cup 96 which

takes support on the brake shoe web. In order to assist the mounting of the springs, the cups are formed with rectangular slots **98** through which are inserted flattened heads **100** provided on the pins so that by rotating the pins a quarter of revolution, the flattened heads are seated into a recess **101** formed in the cup **94** perpendicularly to the slot **98** thus locking the spring in place.

The operating wedge is preferably actuated by a fluid pressure responsive cylinder **16** perpendicular to the backing plate and arranged outwardly, so that the cylinder is subject to an intense cooling being swept by a stream of air which is created by the motion of the vehicle.

The cylinder **16** is provided with an inlet port **102** and a bleeding port **104** which is closed in normal position by a bleeding screw **108**.

A piston **110** mounted in the cylinder is formed with a central projection **112** which, in normal position of the hydraulic system, takes support on the cylinder head, under the action of the return spring **38** acting on the operating rod **14**. The projection **112** is formed with a slot **116** which registers with the feeding port **102** so that in normal position, the fluid pressure responsive cylinder **16** is connected to the piping of the hydraulic system. An annular sealing cup **118**, made of rubber, is inserted in a groove **120** formed on the projection **112**. The object of this cup is to prevent seepage of liquid along the piston.

The angular position of the cylinder **16** can be adjusted so that in any position of the applying means on the backing plate, the bleeding port **108** can be arranged on the top of the cylinder. Thanks to this structure, the fluid pressure responsive cylinder can be located in any place available on the vehicle.

The wheel cylinder is preferably mounted through the intermediary of a cross member **122** which acts as a seat for the return spring **38**. The cross member **122** takes support on one side of an annular shoulder **124** formed on the cylinder, while the opposite end of this shoulder takes support on a bracket **126** preferably secured in place by means of the bolts **48** which serve for securing the casing **46** to the backing plate. The bolts **48** pass through openings **128** formed in the bracket and on the ends of these bolts are mounted nuts **130** by means of which the cylinder **16** is firmly secured to the backing plate. By dismounting the nuts **130**, the cylinder can be easily removed, and it is possible therefore to replace a cylinder of one diameter by a cylinder of another diameter, thus increasing the range of vehicles adapted to be equipped with the brake forming the object of my invention. The fluid pressure responsive cylinder is separated from the operating wedge by a rubber cover **132** inserted on the one hand on the rod **14** and on the other hand on the end of the cylinder.

The brake shoe ends opposite to the applying means take support on an adjusting screw **134** through the intermediary of plungers **136** located in a casing **138**. This casing is mounted on the backing plate, such as by means of screws **140** which extend through cooperating openings formed in the backing plate and in the casing. The plungers **136** are provided with beveled ends **142** which cooperate with notches **144** formed on the beveled head of the adjusting screw **134**.

When the brake linings are new, the adjusting screw **134** is in the position shown on the left hand part of Figure 5, and as the linings become worn, the screw is rotated for one or more notches, for instance by means of a key inserted on a square **145** formed on the outer end of this screw. The adjusting screw **134** is thus driven further and further into the casing **138**, whereby the plungers are spread one from another enabling to keep, when the brake is released, a normal play between the shoes and the brake drum. The adjusting screw **134** carries an abutment ring **136** which, in a position corresponding to the end of the stroke of the adjusting screw, takes support on a boss **148** formed in the casing, thus limiting any further advance of the screw. It results therefrom that when the lining becomes completely worn out, the brake shoe rims cannot wear out due to friction against the periphery of the drum.

The plungers **136** are formed, at their outer ends, with slots, the bottom of which forms an inclined plane on which take support the respective brake shoes through the intermediary of a trunnion **152** formed with a corresponding inclined plane, as described in U. S. application Serial No. 279,266. Each trunnion is located in a corresponding recess formed on the end of the brake shoe web. Thanks to this arrangement, the braking torque transmitted by the shoes is received by members having an area sufficient to resist an important load, while allowing the shoe to rock freely about its end.

Besides the fluid pressure applying means described above, the brake is provided with a mechanical applying means illustrated in Figure 6 and which includes a lever **154** passing through an opening **156** provided in the backing plate and which is formed with a rounded projection **158** taking support on the web of the brake shoe **6**. The lever **154** is connected by a pin **160** to a link **162** provided at its end with a slot **164** into which projects the web of brake shoe **4**. On the outer end of the lever **154** there are provided one or several openings **166** for attachment of the end of a cable or rod connected to the hook-up operated by the hand lever. When the hand lever is put into action, the brake shoe **6** is pressed against the drum and forms an abutment for the lever **154** acting on the link **162**, as a result of which the other brake shoe is likewise applied against the drum. The lever **154** projects through a cover **168** closing the opening **156**, and this cover is applied against the backing plate by means of a leaf spring **168** kept in place by a cotter pin **170** which passes through an opening formed in the lever **154**.

It results from the foregoing that when the brake shoes are brought into contact with the drum by the mechanical applying means, this operation does not affect the fluid pressure operated cylinders due to the fact that the piston **110** is kept immovable by the return spring **38** which acts on the operating rod **14**; the piston projection **112** is therefore kept in engagement with the head of the cylinder. There is thus eliminated the creation of a detrimental vacuum which could tend to take place in case the actuation of the mechanical applying means should affect the hydraulic applying means.

The embodiment illustrated in Figures 7 to 11 is similar to that described above and the similar members in said figures are indicated by some reference numerals.

In this embodiment the operating wedge **12** carries, such as by means of a pin, a slide **172** with two inclined ramps **174** of opposite directions which are parallel to the inclined operating faces of the wedge. Each of these ramps is en-

gaged with a pin 176 carried by the forked links 18.

It results from the foregoing that to each stage of spreading of the links, there correspond sections of the slide 172, which are removed more and more one from another, so that when the wedge 12 is brought to the end of its operating stroke by the fluid pressure responsive cylinder 16, the pins 176 are in contact with the member 178 which connects the inclined ramps, as illustrated in Figure 8.

When the brake is released, the slide 172 brings back the links upon the return movement of the wedge, drawing together the pins 176 by means of the inclined ramps 174, thus bringing them one adjacent the other.

In the embodiment illustrated in Figures 7 to 11, the pins 28 and 30 carry the operating rollers 24, 26 and two pairs of supporting rollers 64 adapted to roll in operation on the inner face of the cover 70 and the pins 28 and 30 are adapted to move in alined longitudinal slots 180 formed in the walls of the casing 46. The outer ends of the links 18 are forked and form a slot parallel to the backing plate in which project the webs of the respective brake shoes. Pins 182 which extend through alined openings provided in the forked ends of the links are formed with heads which in normal position seat in recesses 184 at the ends of the cover. Due to the fact that the heads of these pins take support on the cover in plane extending beyond the plane in which act the return springs 86, 88 inserted between the brake shoe webs, a component is created which, in normal position of the brake, urges the links, with the supporting rollers 64 into contact with the inner face of the cover. The assembly formed by the supporting rollers 64, their pins 28, 30 and the links 18, is therefore locked in place in normal position of the brake, thus suppressing any clicking noise when the vehicle is in motion. As the brake is set into action, the pins 28 and 30 clear the edges of the cover and the supporting rollers 64 roll freely on the rolling table formed by the inner face of the cover, thus insuring an efficient operation of the applying means. As already indicated for the first embodiment, under action of the load, the assembly formed by the links, the operating rollers, 24, 26 and the wedge, is alined in one plane, thus avoiding any wedging effect.

The brake embodiment illustrated in Figures 7 to 11 is provided with an adjusting means similar to that shown in Figure 5 with this difference, however, that it comprises novel means for adjusting of casing 138 in the plane in which the plungers 136 act on the respective shoes. The casing 138 is located in a cylindrical eccentred member 186 mounted in an elongated vertical opening 181. The casing 133 is secured to the backing plate by means of screws 140 which extend through elongated openings 183 provided in the backing plate. It results from the foregoing that by rotating the eccentred member 186, after having previously loosened the screws 140, the position of the casing is adjusted in the plane in which act the plungers, while the eccentred member 186, adjusts its position in the elongated opening 181, being kept in linear contact with the walls of said opening. The eccentred member 186 is formed on its outer side, for instance with a hexagonal section 190 projecting into a complementary opening provided in a plate 192 immobilized by means of a screw 194 secured to the casing. The screw 194 extends through an arcuate slot 196 formed in the plate, in order that the latter could shift with the eccentred member 186 when one proceeds to the adjustment of the position of the casing on the backing plate. When the adjustment is completed, the screw 194 is fixed in place thus immobilising the eccentred member 186 through the intermediary of the plate 192.

A suitable choice of the position of the adjusting means on the backing plate enables to compensate manufacture clearances, which is realised in the first embodiment by adjusting the position of the cover 62 on the casing 46.

It is to be noted that the attachment of the casing by means of screws which extend with play through openings provided in the backing plate brings about the danger inherent to a possible loosening of the screws under the action of trepidations taking place during the motion of the vehicle. This risk is eliminated in the embodiment illustrated in Figures 9–11 due to the fact that the casing of the adjusting means mounted in the eccentred member 186 is kept in linear contact with either edge of the elongated port 181 formed in the backing plate.

Under the action of lateral return springs, the brake shoe rims take support either directly in a recess 198 provided in the backing plate, as illustrated in Figure 14, or on stops 200, of variable height, as shown in Figures 12 and 13. The use of stops of variable height enables to use the same backing plate for brake shoes and drums of various widths. The stops 200 can be riveted to the backing plate and mounted at the end of a lug 22, the opposite end of which is secured to the backing plate such as by means of a rivet 204.

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BRAKES

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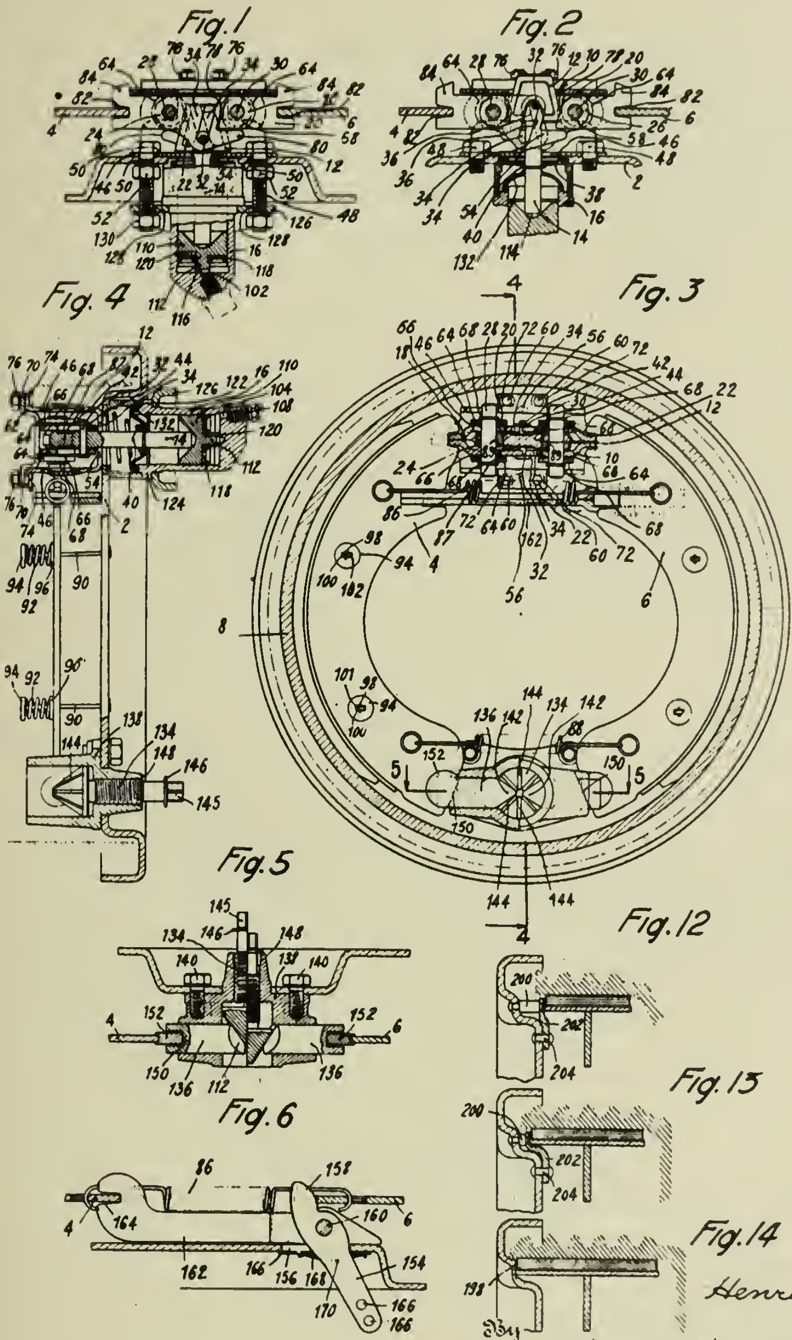

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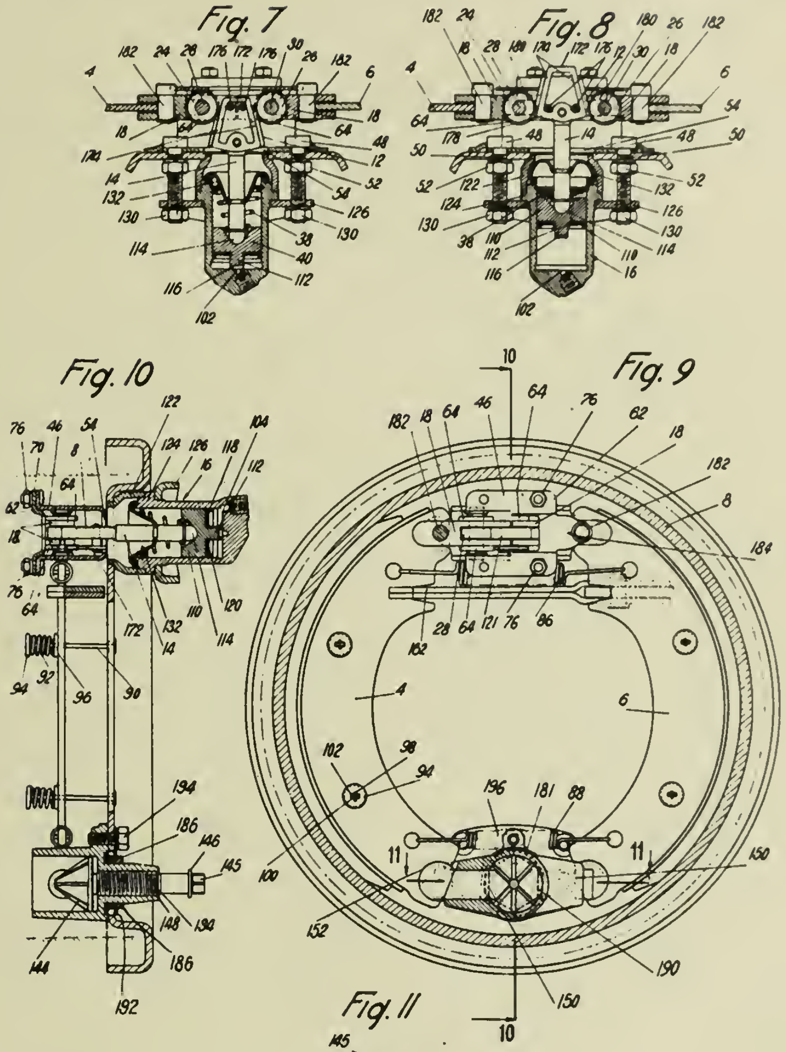

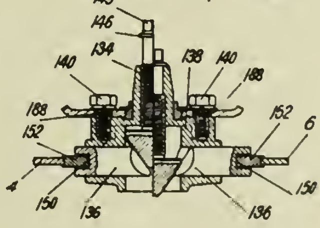

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ALIEN PROPERTY CUSTODIAN

MULTI-DRIVE GEAR BOX

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Application filed May 21, 1942

The present application forms a continuation in part application of my co-pending application Serial No. 207,115 filed May 10, 1938.

My invention relates to the mounting of accessories on an aircraft or the like.

It is known that modern aircraft are provided with a number of accessory apparatus such for example as high, medium and low pressure air compressors, vacuum pumps, electric generators, hydraulic pumps, etc., the operation of which is necessary for the operation of numerous instruments.

Hitherto such accessories have generally been directly mounted on the engine, but the multiplicity and variety of said accessories makes such a mounting more and more difficult. Furthermore, engine constructors are in that case obliged to provide on their engines brackets and driving devices which are not always used, in the case of multi-engine aeroplanes, for example. This therefore leads to making rear parts of engines different, according to the use on the aeroplane, and this is very disadvantageous as regards interchangeability.

It has also been proposed to drive these generators by means of electric motors or by auxiliary engines, but these solutions are generally heavy and costly, and do not permit the lubrication of accessories.

My invention has for its object a multidrive gear box designed to removably carry accessories and to supply the same with power and with lubricating oil under pressure so that said accessories are placed under exactly the same conditions as are obtained when they are mounted on an engine.

A further object of my invention is a box of the aforesaid type adapted to be fixed to the structure of the airplane and to be driven by the engine through the medium of a common double Cardan shaft or the like allowing the engine to oscillate or to be displaced relatively to the box.

Other objects of my invention will be apparent in the following description taken with reference to the accompanying drawings, given solely by way of example and in which:

Fig. 1 is a mounting diagram of accessories on an aeroplane in a manner according to the invention;

Fig. 2 is a corresponding partial view looking in the direction of the arrow designated by *f* in Fig. 1;

Fig. 3 is a vertical section, on a larger scale, of the movement take-off box, along the axis of the drive shaft;

Fig. 4 is a similar view to Fig. 3 of the movement take-off on the engine;

Fig. 5 is a partial section along the line designated by V—V in Fig. 2;

Fig. 6 is a view of a modification of the drive shaft;

Figs. 7 and 8 are two sketches showing the lubricating arrangement;

Fig. 9 shows diagrammatically the pump.

In the embodiment shown it has been assumed that five accessories are to be mounted, viz,: an electric generator **1**, a high pressure air compressor **2**, a medium pressure air compressor **3**, a vacuum pump **4** also serving as a low pressure compressor, a hydraulic pump **5** serving for example for supplying jacks not shown. Said five accessories are fixed on the outside of a case of a multidrive gear box **6** which is directly fixed on the structure of the aeroplane in such a manner that it is independent of the engine **7** carried by its supporting frame **8**, by means of horizontal cross pieces **9** which are fixed at their ends on the edges of a window **10** provided in the fire-shield partition **11**. The box **6** contains a suitable number of output components, five in this case, which are actuated by a common shaft **12** extending from a driving head **13** fixed on the engine above the movement take-off which is provided for this purpose on the back of the engine **7**.

The gear box **6** is itself composed of a substantially flat case having a vertical and substantially plane rear face and a front face comprising two plane vertical portions on either side of the central nose **14** serving as a housing for the main shaft **15**. It is on said plane faces that the accessories are adapted to be mounted so that they cover the movement take-offs. The central nose **14** furthermore has at its upper part an inclined plane face **16** which serves as a support for the generator **1**. The main shaft **15** drives the various accessory devices driving shafts **17** through the intermediary of suitable gears **18** and is itself driven, through the intermediary of a friction coupling **19** forming a torque limiting device, by the drive shaft **12**. This latter engages endwise with the driving part of the coupling **19** through the intermediary of splines **20** having a slight play which enables the shaft **12** to take up a slight incline relatively to the shaft **19**. Furthermore, the driving splines are shorter than the driven splines so that the shaft **12** can slide longitudinally. At its opposite end, the shaft **12** penetrates into the driving head **13** which is formed by a case **24** fixed on the case **25** of the engine **7** above the movement take-off which is in this case formed by a

bevel pinion 26 the shaft 27 of which is actuated by the engine 7. The case 24 supports a shaft 28 on which is fixed a pinion 29 meshing with the pinion 26 and said shaft 28 is connected to the shaft 12 by a swivel joint 31 and splines 32 similar to the splines 20. The shaft 12 is furthermore so dimensioned as to form a resilient shaft which damps the vibrations and the variations of torque of the engine.

At the end of the shaft 17 which is intended for driving the generator, is arranged a torque limiting device 34 which is adjusted in such a manner that it can only transmit the maximum torque required for normally driving the generator, this being done in order to protect the members of the gear box from the effects of inertia of the rotor of the generator in the event of a sudden stoppage of the engine.

The case of the gear box furthermore contains a double gear pump 36 comprising a first pair of gears 36 forming an oil pump proper, coupled with a further pair of gears 37 forming a scavenging pump (Figs. 3 and 7 to 9). Both said pairs are driven through the intermediary of a toothed wheel 39 by the main shaft 15.

As shown in Fig. 7, the gears 36 suck oil from the oil tank 40, which may be the oil tank of the engine, through the pipe 41 and forces same through a pipe 44 in a lubricating circuit. The said circuit includes on the one hand passages 45 adapted to supply the gears of the box itself and further passages 46 opening in the faces of the case of the box in register with corresponding passages 46—provided in the fixing flanges of the accessories 2, 3, 4, 5, which flanges are pressed against said faces to form a joint therewith. The pipe 44 is in communication with a relief valve 48 provided with an overflow pipe 49 and through a pipe 49′ (Figs. 3, 7 and 8) with a pressure gauge 50.

The oil which has lubricated the accessories returns in the case of the gear box through the passage formed for the output component. The said oil, together with the oil used for the lubrication of the gear box is sucked up at the bottom of the case in the inlet pipe 52 of the scavenging pump formed by the gears 37, and is delivered through the pipe 53 to the oil tank 40. The case of the gear box is thus kept dry, thereby preventing losses of oil which are particularly objectionable on board aircraft and the lubrication of the accessories is obtained together with their driving.

In the modification of construction of Fig. 6, a swivel joint 59 is provided to support the end of the drive shaft 12 at the entrance of the movement take-off box 6. In this case the two male and female parts are connected to each other by driving splines 60 which allow them a slight transverse play and the driving part is mounted on the shaft 12 by means of a splined sliding mounting 61. The shaft 12 is furthermore remotely surrounded by a protecting casing 62 having a flexible or resiliently deformable part.

Of course my invention is in no way limited to the constructional details described or illustrated which have only been given by way of example. Thus there may be any number of accessories and they may be distributed in any manner over the common movement take-off box. The swivel jointed modification shown in Fig. 6 can be used for the driving head which is fixed on the engine or again simultaneously on both ends of the shaft 12. The oil pump which forms an autonomous lubricating means for the movement take-off box may also be separately fitted on the outside of the case instead of being incorporated therein.

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Fig.1

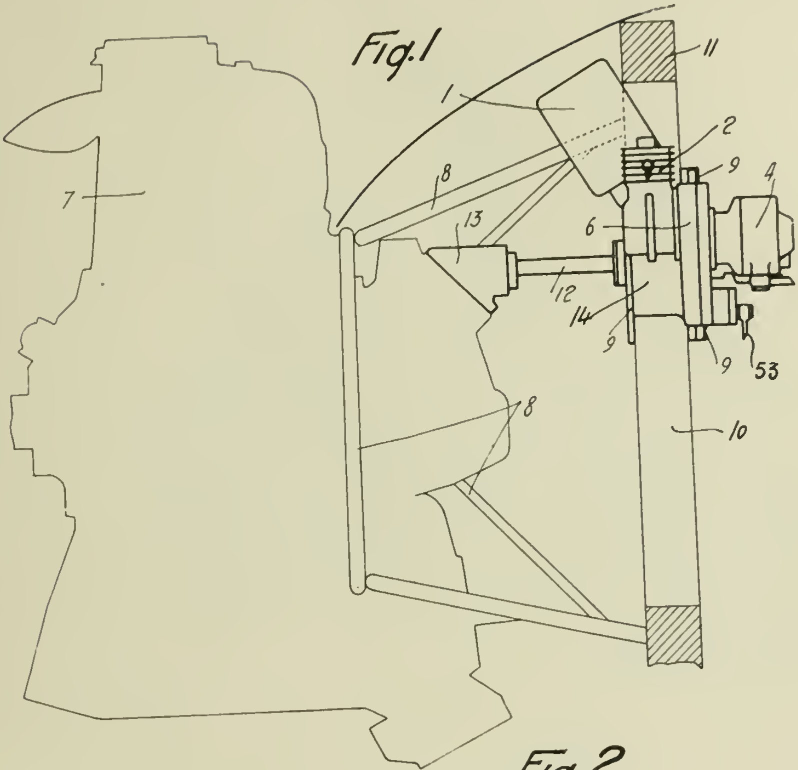

Fig.2

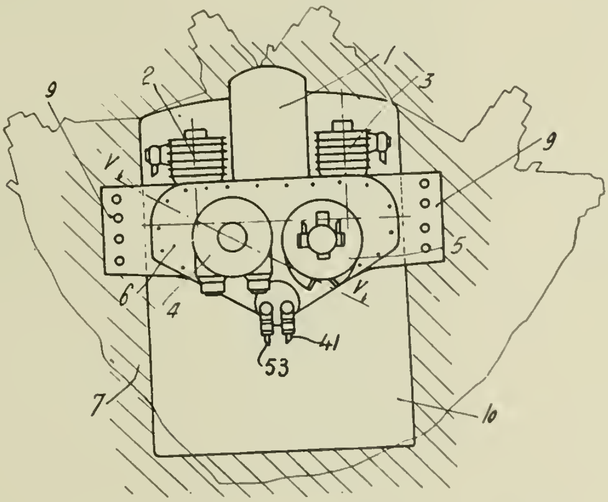

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Fig. 3

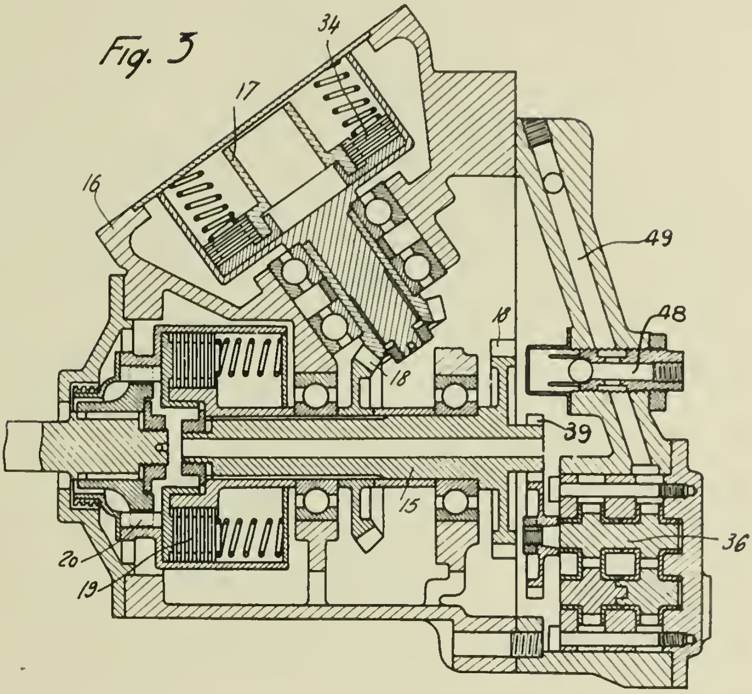

Fig. 5

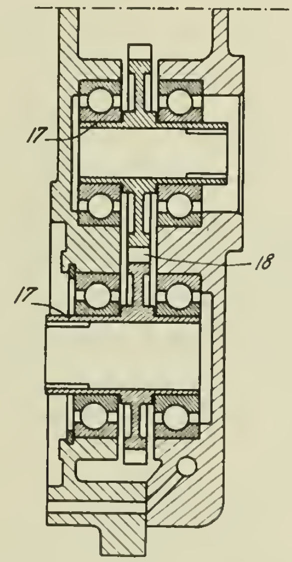

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Fig. 4

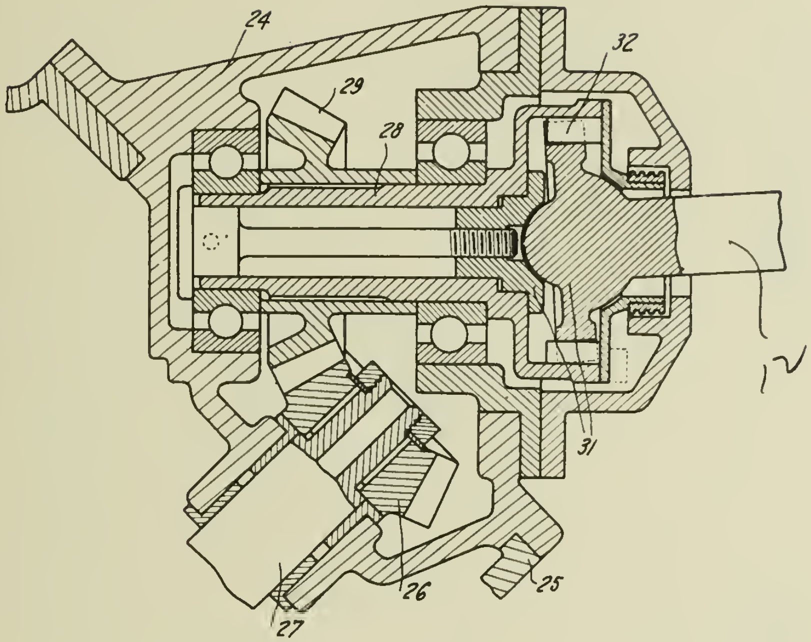
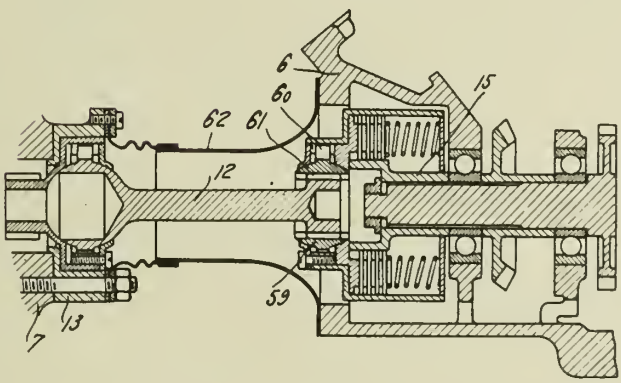


Fig. 6



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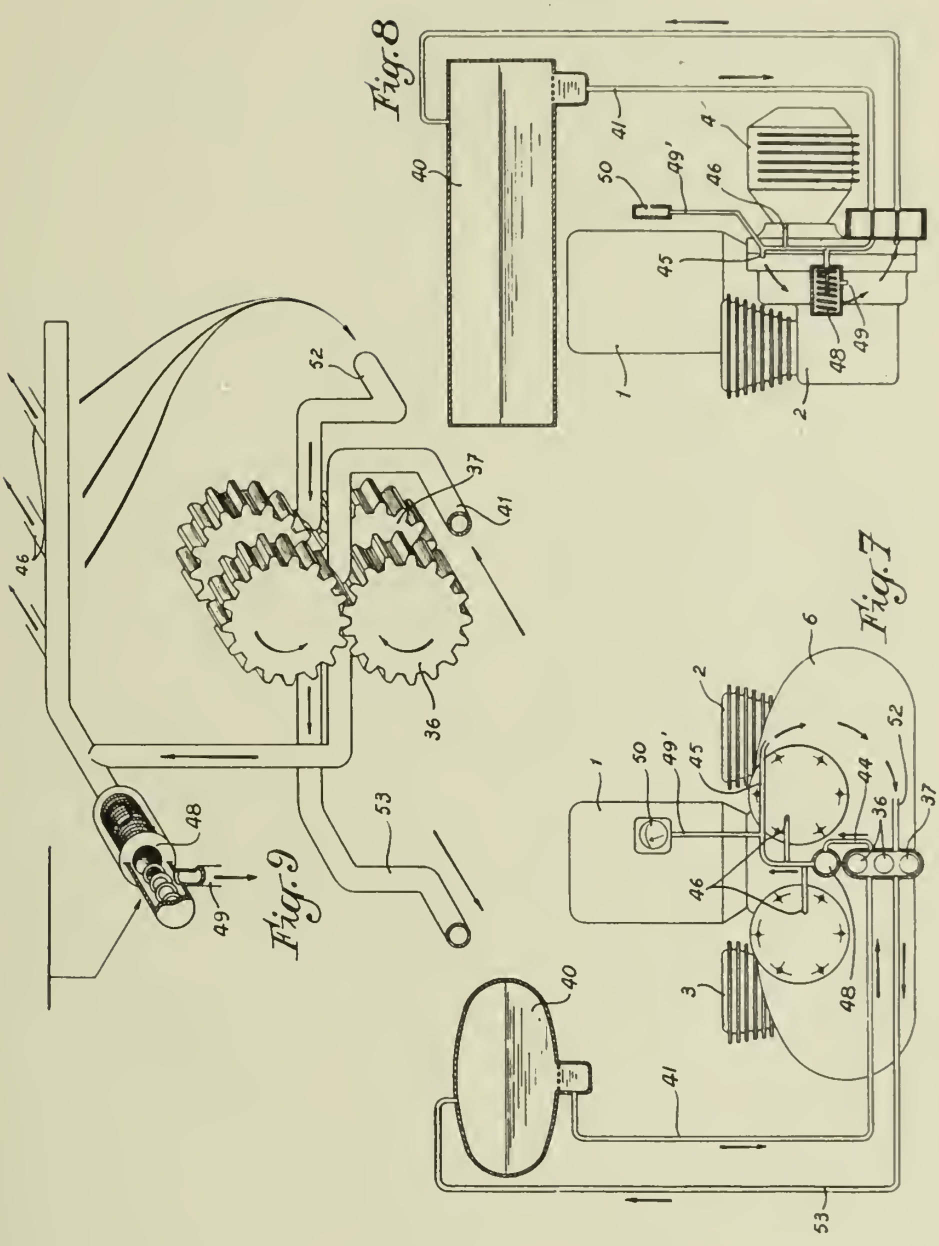

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ALIEN PROPERTY CUSTODIAN

MEANS FOR DRIVING AN ELECTRIC GENERATOR ON BOARD A SHIP

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Application filed June 2, 1942

Most engine-driven ships at present have electrical installations for lighting and for driving auxiliary machinery. The electric generator has always been provided with a separate driving machinery due to the need of keeping it running even when the propelling machinery is stopped.

The present invention is based on the consideration that the separate driving machinery for the electrical equipment of the ship always must have a lower efficiency than the main machinery and moreover involves an extra onus of lubrication and attendance. During the long periods of normal going, such a machinery is in fact not necessary. It has therefore been found that a considerable saving is made by driving, during normal going, an electric generator from the propeller shaft, that is, from the main driving machinery of the ship, in spite of a separate reserve machinery always being necessary for supplying the electrical energy when the propelling machinery is at rest or runs at a reduced speed.

In practice, it has, however, been found that it is not possible to run an electric lighting generator directly from a propeller shaft driven by a reciprocating engine, as the speed pulsations of the latter are so large that the light will be too uneven. According to the present invention, the generator is therefore driven from the propeller shaft by means of a speed increasing transmission and a speed equalizing coupling.

The transmission preferably consists of a double tooth gearing, as the speed ratio should preferably be rather high. Especially in old ships, where the conditions may render the installation of such a gearing difficult or impossible, a belt transmission may be used, at least for one of the transmission steps. The speed equalizing coupling should preferably be placed between the transmission and the generator, in order to obtain the smallest possible dimensions. It may for instance consist of a spring coupling or a hydraulic or electrodynamic slip coupling, the last-mentioned type thus consisting of one member having D. C. poles and a member cooperating therewith and having a short-circuited A. C. winding.

Two forms of the invention are illustrated in the accompanying drawing, one in a plan view, partly in section, in Fig. 1, and the other in a side view, partly in section, in Fig. 2.

In Fig. 1, **1** designates the propeller shaft, **2** its thrust bearing, **3** a double tooth gearing, **4** an electerodynamic slip coupling having D. C. excited poles **41** and a short-circuited secondary winding **42**, and **5** is the electric generator which is placed at the side of the thrust bearing.

In Fig. 2, the different parts are designated in a corresponding manner, but the generator is situated on the top of the thrust bearing.

It is also possible to combine the gearing and the thrust bearing to one constructional unit having a common casing. If a slip coupling is placed between the reciprocating engine and the propeller, a separate slip coupling may not be necessary for the generator.

When the speed of the propelling machinery is reduced or brought to standstill, the generator should be disconnected mechanically from the propeller shaft as well as electrically from its load. This disconnection may be effected automatically in dependence of the operation causing the speed reduction or stopping, or possibly in dependence of the signal from the bridge causing such operation. In using an electrodynamic slip coupling, the disconnection is most simply made by breaking the magnetizing current.

The generator may be provided with a separate flywheel for keeping it running during a short period after the disconnection of the coupling. In such a case, the electrical disconnecting means for the load of the generator may be somewhat retarded with respect to the disconnecting means of the coupling.

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BY A. P. C.

T. EEK

MEANS FOR DRIVING AN ELECTRIC GENERATOR ON BOARD A SHIP

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Serial No. 445,426

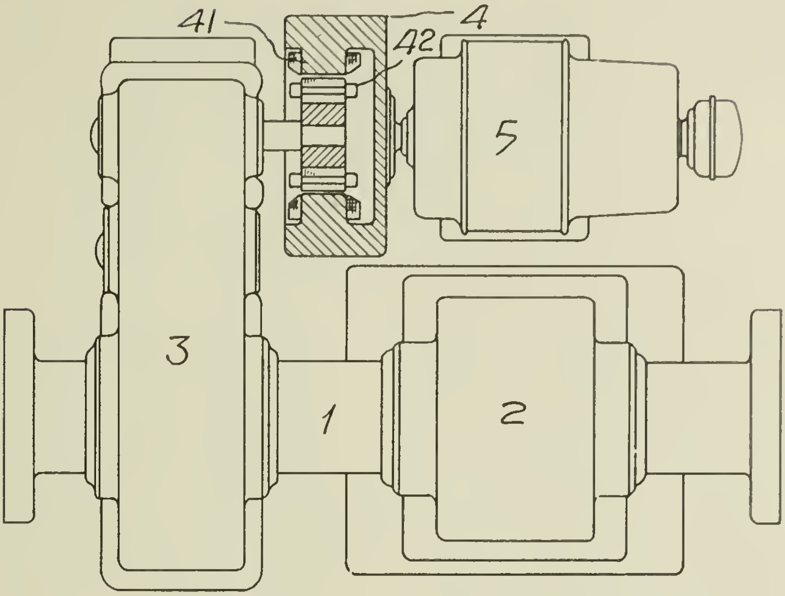

Fig. 1.

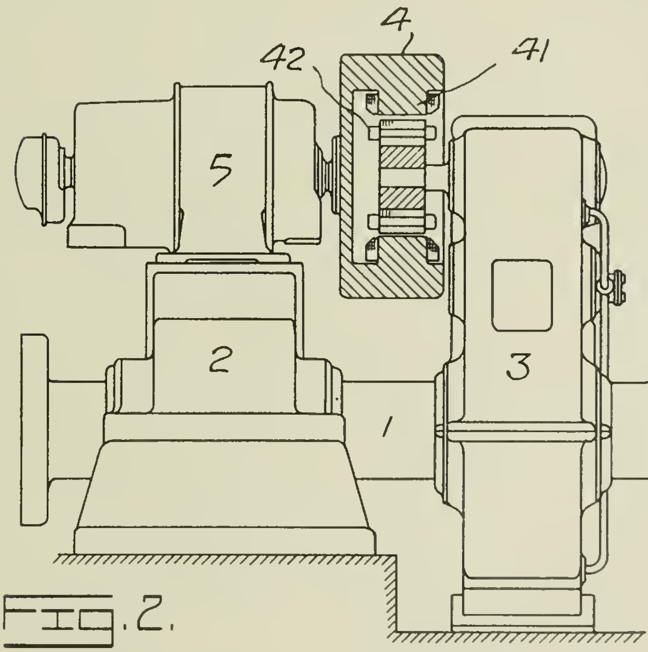

Fig. 2.

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ALIEN PROPERTY CUSTODIAN

METHOD OF TRANSITION FOR PASSING FROM A CONNECTION TO ANOTHER IN COUPLINGS OF DIRECT CURRENT MOTORS

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Application filed June 9, 1942

This invention relates to a method of transition for passing from a connection to another in couplings of direct current motors.

It is well known that in plants adapted for supplying mechanical energy by means of a plurality of electric motors supplied with direct current under a constant voltage and more particularly in electric locomotives and rail motor cars, one of the methods of regulation which are generally used consists in varying the voltage at the terminals of the armatures of the motors by modifying the method of coupling of the latters and by connecting them according to the requirements either in series or in series-parallel or in parallel so as to distribute the constant voltage of the means in an adequate manner among them.

It is also known that in a general manner when passing from a connection to the following the change of voltage cannot be effected directly and that for avoiding considerable rushes in the intensity of the current applied to the armatures of the motors and in the torques or the corresponding traction stresses, with all the dangers involved in such jerks from the mechanical and electrical point of view, it is necessary, as regards the voltage applied to the armatures, to pass through one or more intermediate conditions insuring a progressive transition.

But all methods which have been used hitherto for effecting such a passage from a connection to another involve the use of a devolting device or negative booster (resistance, group, battery and the like) which during the transition has for its duty to absorb a material fraction of the available energy and which, therefore, must be largely dimensioned, which results in that the weight and the space required are comparatively out of proportion with the result to be obtained, owing to the rapidity with which the transition is practically effected.

One has tried, it is true, through certain modifications, to reduce the importance of the devolting devices in question.

More particularly one has tried to attain this result by causing the last economical curve of the lower connection by means of a suitable shunting to come as near as possible to the first normal economical curve of the upper connection.

In this respect the device described in the British patent No. 10.072 of 1907 may be quoted by way of example.

However, in the present state of the art and for the usual types of motors it has not be possible hitherto by this sole means entirely to do away with the resistances specifically limiting the intensity and the stress, that is to say the so-called "transition resistances" or with the equivalent special auxiliary devices.

The present invention has for its object a method of transition which regardless of the number of motors of the coupling permits to pass from one connection to the upper connection without the use of any transition resistance or any other auxiliary transition device.

According to the invention, this result is obtained by combining a raising of the last speed-stress curve of the lower connection, which raising is obtained by means of a suitable shunting, with a lowering of the first speed-stress curve of the upper connection, which lowering is effected by means of a suitable temporary reinforcement of the inductor fields.

Then the necessary shunting and field reinforcement require only the intervention of devices which do not require much space. They can be obtained by any known means, more particularly by means of the variable resistances of the auxiliary motor-dynamo groups which are used for the regulation or by suitable connections of the inductor fields themselves.

One immediately conceives that if the respective shiftings of both curves in question are judiciously chosen and performed, the upper connection curve the lowering of which has been obtained will intersect the lower connection curve, the raising of which has been obtained, in such a point that the variation of intensity applied to the armatures during the change of connection will be acceptable, owing to which for speeds approximating the speed corresponding to the above mentioned point of intersection the transition will be effected without any appreciable jerk.

The above described method is particularly advantageous when according to what has been indicated in the patent application P. V. no 453.902, filed by the applicant company on December 30th, 1940, the couplings in series-parallel or in parallel which have been effected comprise an inductive chain in which either the totality or only complementary fractions of the inductor windings of the various motors are connected in series.

The said chain which, moreover, can be either connected with one of the points which are common to the parallel branches or separated from the latter permits, indeed, an easy application of the shunting and the field reinforcement which underly the method.

The diagram of Figure 1 shows the results

which can be obtained with the already known method of raising the lower connection curve by shunting.

In this figure, S and P are the speed-stress curves of the whole of the motors for the lower connection and for the upper connection respectively. I is the curve of the intensities for a motor.

If it is intended to effect the transition from the lower connection to the following at the moment where the speed of the machine which will necessarily remain constant during the operation is equal to V^1, the total stress being equal to F_1 and the intensity to I_1, it can be seen that if one would proceed without any precaution the stress would pass instantaneously from the value F_1 to the value F_2, the intensity passing itself from I_1 to I_2 for each motor.

From the point of view of the stresses and of the intensities there would be, therefore, prejudicial jerks.

The above mentioned shunting method which has for its effect to raise the speed-stress curve and to lower the curve of the intensities already permits to obtain a progress which manifests itself by the use of the curves S_1 and I' drawn in chain lines.

If, under the new conditions which have been achieved but, of course, at the same constant speed V_1 one passes first from the curves S and I to the curves S_1 and I', one sees that the stress becomes $F'_1>F_1$ the intensity for each motor becoming I'_1.

Thus, by this means the stress jerk has been reduced from $F_2—F_1$ to $F_2—F'_1$.

Hitherto, however, it has not been possible without the use of transition resistances to reduce the difference $F_2—F'_1$ to an acceptable value.

Figure 2, on the contrary, shows the results obtained with the present invention.

This figure is a reproduction of the preceding diagram but with the indication of the curve P_1 which shows the lowered position of the curve P, this new position being obtained, as already mentioned above, by a reinforcement of the fields of the motors the armatures and possibly a fraction of the inductors of which are now grouped in the upper connection.

One sees, on this figure, that the lowered curve P_1 intersects the raised curve S_1 in a point near the horizontal line drawn through V_1, so that the stress F''_1 which corresponds to the constant speed V_1, is higher than F'_1 but near the latter.

It is thus obvious that the passage from the curve S_1 to the curve P_1 can be effected without any mechanical jerks.

One sees also that the intensity for each motor has become I''_1 which is also near I'_1, which shows that also electrical jerks are not to be feared.

It is now sufficient, for attaining the normal curve P, to reduce progressively the temporary reinforcement of the fields which had permitted to lower the curve P until P_1.

As it is easy to conceive, this method is absolutely a general method with which no transition resistance is used.

As already mentioned, both operations: the shunting on the one hand and the reinforcement of the inductor fields on the other hand can be effected by any known means, as, for instance, by means of variable resistances or by means of auxiliary groups of small importance or through field connections.

One conceives that the equipment of the vehicles is considerably enlightened thereby with respect to the known systems where the transition requires the use of transition resistances or other special auxiliary devices as those which are mentioned above.

The amelioration is still more noticeable when, as in the forms of execution which will be described later on, it is the regulation device itself which serves simultaneously as shunting means and as reinforcing means for the inductor fields.

Several forms of execution will be described now and are shown in the appended drawings by way of examples.

Figures 3 and 4 are diagrams showing the application of the invention to a group of two series-motors, Figure 3 showing both motors connected in series and Figure 4 showing the upper connection.

As can be seen, in the starting series connection the inductor windings **1'** and **2'** are connected in series according a known arrangement down the line of both armatures **1** and **2**.

As to the upper connection which is to be effected, it is to be noted that the armatures **1** and **2** alone are connected there in parallel, the inductors **1'** and **2'** remaining in series, but it is easy to see that the characteristics obtained with this latter kind of connection can be identical with those obtained with the normal connection of the series-motors if the current which flows through the chain of inductors is the same as the current which flows through a single branch of the armatures, a condition which it is always possible to answer by judiciously shunting the said chain of inductors.

The maximum shunting curve of the connection according to Figure 3 can be obtained, for instance, by the insertion of resistances in parallel with both windings or by short-circuiting a certain number of turns of the inductor windings (method of the "tap fields") or by the use of a dynamo connected across the terminals of the said inductors, or by any other known means.

In the example shown the shunting of the inductors **1'**, **2'** is effected by means of two resistances *r* and *p* respectively, provided each with a make and break switch *a* or *b* respectively.

This being stated, the transition is effected as follows:

The driver first closes both switches *a* and *b* whereby he can obtain the maximum shunting curve which forms the last curve of economical speed of the connection in series.

Then, at the moment chosen by him, he opens the switches *a* and *b*, after which he immediately connects both armatures accompanied by their respective auxiliary windings in parallel. From this moment, the current which flows through the chain of inductors being twice each induced current, the normal full field curve of the connection in parallel is considerably lowered and according to the characteristics proper to each case it can be sufficiently near the shunted curve and even intersect it in a zone of admissible intensities and stresses, which, as mentioned above, is the necessary and sufficient condition for obtaining a transition without jerks.

It appears with evidence that in order to take advantage of all the economical speeds offered by the connection in parallel it will be sufficient now progressively to insert anew the shunting resistances which will be made adjustable for this purpose.

The return to the connection in series is effected without any difficulty by making the operations in the reverse order.

As one sees, the transition has been effected without the insertion in the main circuit in direct connection with the armatures of considerable resistances which, in the above mentioned example, would have forcibly absorbed a material fraction (½) of the feeding voltage.

The shunting resistances which have been used can be of reduced dimensions, since they are fed with a very weak voltage; on the other hand, as already mentioned, they are used not only for the transition but also for the obtention of a range of economical speeds.

Of course, any other suitable method of shunting using means other than resistances could be used for solving the problem of the transition.

More particularly, in the case when the calculation would show that the curve of the upper connection with reinforced field obtained by the summation, in the inductors, of the currents which flow through the parallel branches would not be sufficiently low, it would be convenient to take as an auxiliary device a motor-dynamo group connected across the terminals of the inductors connected together in series, the said group being then able to serve alternately for the shunting of the said inductors and for the reinforcement of the field according to the output of the dynamo.

However, the use of such a motor-dynamo group as means for the reinforcement of the field is the less necessary the more considerable is the number of the motors of the grouping.

Indeed, as the applicant company has shown it in its above mentioned application No. P. V. 453,902 of December 30, 1940, it appears that the higher the number of parallel branches the more considerable the current which flows through the inductor chain in series. If, therefore, starting from a connection in series or in series-parallel one passes to an upper connection comprising a substantially larger number of branches, the field will be reinforced automatically and, therefore, the characteristic of the new connection will be lowered in a measure which will be a function of the increase of the number of parallel branches.

Making application of what has been stated above and generalizing the arrangement of the Figures 3 and 4, one will now describe the application of the method according to the invention to the case of n motors with split up excitation, grouped in m branches of each u motors ($mu=n$) and which it is intended to group in p parallel branches of each h motors, it being understood that one has $u>m$ and, therefore, $h<u$ with $ph=n$.

Passage from the lower connection to the upper connection.—Figures 5 to 9 are diagrams showing the method applied to the raising transition.

In all these figures it has been supposed that each armature 1 . . . n is connected with its auxiliary changing over windings and with a fraction 1′ . . . n' of its inductors, the complementary inductor windings 1″ . . . n'' being connected in series in a chain connected, on the one hand, with the common point down the line of the parallel branches and, on the other hand, with the negative pole of the supply.

It is obvious, however, that the ends of the chain could be connected, on the contrary, with the common point up the line of the parallel branches and with the positive pole of the supply respectively.

Thus Figure 5 shows a connection in series-parallel with reinforced field of the most general case.

Proceeding according to the present invention one will obtain first the maximum shunting curve in the connection under consideration and this by one of the known means recalled in the above mentioned application and comprising the use of an adjustable resistance, of a motor-dynamo group, of a battery and the like.

In the example shown in Figure 6 one has chosen an adjustable resistance R which can be connected or disconnected by closing or opening a switch o.

The slide which occupied any position (shown in dotted line) being brought to the position of minimum resistance (full line) the shunting of the group of motors is maximum.

The result thereof is that the conditions which are established correspond to the highest curve possible of the connection under consideration.

From the moment where these conditions are met, the driver can effect the transition.

For this purpose, in order to establish the desired conditions for obtaining that in the following period the situation corresponds to the lowest curve of the reinforced field, he begins first, according to the circumstances, either by opening the switch *o* or, if this is sufficient, by bringing the slide to an adequate position (not shown).

Immediately thereafter, by means of suitable switches such as *d* (Figure 8) which are all controlled simultaneously, he short-circuits $u—h$ motors in each of the m parallel branches.

Then he has nothing more to do than to separate these m fractions of branches by opening switches *e* and by means of switches *f* to unite these m $(u—h)$ motors grouped in $p—m$ branches of h motors in series in parallel beside the m first branches (Figure 9).

From this moment the transition is achieved and, starting from the lowered curve of the upper connection which is used, it is possible to resume the regulation of the machine by varying the shunting through shifting the slide on the adjustable resistance R until the position which is deemed suitable, and closing the switch o.

Moreover, what has been said above gives rise to the following observations:

The means which serves for the regulation in the lower connection serves also for carrying out the immediate preparations for the transition proper and then the regulation in the upper connection.

On the other hand, for effecting the transition, it is not necessary, in every case, to start from the maximum shunting curve of the lower connection, not to lower to the maximum the curve of reinforced field of the upper connection which has been chosen.

It is sufficient to obtain, for the speed at the moment considered, a sufficient mutual intersection of a shunting curve of the lower connection and of a curve of reinforced field of the upper connection. In other words: it is possible, in certain cases, to maintain a certain degree of shuntage. One conceives, moreover, that this can be effected possibly by a single position of the slide on the resistance R.

One can also conceive that for a predetermined speed and stress there can be two curves intersecting one another so that there is absolutely no reaction to the transition for this point of

working. For a better comprehension of it, it is sufficient to refer to the curves of Figure 2.

Moreover, the description of the preceding transition has shown a step (Figure 7) in which one comes again, in fact, to the connection of Figure 5 before passing to that of Figure 8.

As a matter of fact, this step is practically confounded with the following (Figure 8) which consists in court-circuiting the $u—h$ motors of each branch.

Indeed, owing to the electrical and mechanical inertiae as well as to the rapidity of working of the electrical equipment, all happens in the like manner as if the connection according to Figure 8 followed directly that of Figure 6.

Finally, the passage from Figure 8 to Figure 9 being also exceedingly rapid, it is to be noted that if the intensities in the inductors of the chain $1'' \ldots n''$ succeed in following the control of the positions supplied by the equipment, the mechanical parts and more particularly (when the object under consideration is rolling stock) the couplings are by no means affected through these electrical variations. Furthermore, these electrical variations take place under good conditions for the motors and there is absolutely nothing to fear for the good behaviour of these motors.

Summing up, taking into account, on the one hand, the rapidity of the working of the equipment and, on the other hand, the electrical reliability due to the instantaneous reinforcement of the field (Figure 8) which results from the mode of connection, one conceives and the calculation shows that the transition can be effected with jerks which are as reduced as it is desired.

It may be pointed out by the way that the sudden variations of intensity and the superintensities to which the various armature or inductor windings of the motors are submitted offer no danger for the latter if care is taken to reinforce the wirings and the electrical connections inwardly of the said motors (weldings, anchoring of windings and the like).

Moreover it is advisable to indicate that it is not necessary to short-circuit the complementary windings of the $m(u—h)$ motors at the moment of the short-circuiting of the latter (Figure 8) since their armatures are then inactive.

Return to the lower connection.—The downward transition (passage from the upper to the lower connection) is effected in a reverse manner, that is to say by placing oneself in the conditions which correspond to the curve of reinforced field of the upper connection, then by putting out of circuit the $m(u—h)$ motors in their $p—m$ branches and by placing them into the m first branches again, for instance in the tail-end and finally by uniting them to the circuit of these m branches.

The diagrams of Figures 10 to 14 show the continuation of these operations.

The diagram of Figure 10 shows the connection in series-parallel where the n motors are grouped in p branches of h motors each.

In the course of running the slide of the variable resistance R rests on any notch of this latter, thus insuring a certain shunting of the chain $1'' \ldots n''$.

For initiating the transition one first brings the slide on a less high shunting notch in order to obtain the desired field reinforcement which is maximum if the switch o is opened as shown in Figure 11.

Then the $p—m$ branches are disconnected by opening the switches f (Figure 12).

The $(p—m)$ h motors are then grouped in m series of $u—h$ motors which are connected with the tail of each of the m branches which remained connected and this by means of the switches e, while the switches d are maintained closed, so that the said motors are first short-circuited (Figure 13).

For achieving the operation it is now sufficient to open the switches d in order to connect the $u—h$ motors added to each of the m first branches (Figure 14) and one can then with the so reestablished lower connection resume the regulation of the machine by shunting by means of the adjustable resistance R, the switch o being closed at the desired moment.

In the above described example one has admitted that the complementary chain $1'' \ldots n''$ was invariably secured to the common point up or down the line of the parallel branches, but as will be seen later on in the examples of Figures 15 and 16, it is obvious that a separated feeding of the said chain would permit the application of the method with the same facility in the upward as well as in the downward direction.

Figure 15 shows the same starting grouping as that of Figure 5 as regards the m parallel branches containing each u motors with a split up excitation, but in which the complementary chain is supplied by a dynamo G driven by a motor M which is supplied itself by the common source for the motors.

In this figure the regulation of the voltage at the terminals of the complementary chain, which regulation is the condition for the obtention of characteristics which are favourable to the transition, is insured by the winding E connected in series with the parallel branches, controlled by a switch k and regulated by an adjustable resistance r connected in parallel with the terminals of the said winding

Generally, the separated complementary winding E_1 has not to intervene in the operation of transition.

As before, the upward transition operation is effected by starting from a high characteristic of the lower connection obtained in a similar manner by inserting the minimum of resistance r which has for its effect to reduce the current flowing through the winding E (the switch k being closed) and, therefore, to diminish the current which flows through the complementary branch.

In other words, the obtained effect is similar to a shunting effect of the complementary fields.

Of course, the maximum shunting curve (minimum current in $1'' \ldots n''$) will be obtained by opening the switch k or by the insertion of the minimum value of the resistance r.

Starting from this position of the characteristic it will remain only to effect the operations which have been described in the preceding case, namely: reinforcement of the complementary fields through the shifting of the slide of the resistance r in the direction of the increase of the said resistance; short-circuiting of the $u—h$ motors in the m parallel branches; formation of the p parallel branches through the adjunction of $p—m$ new branches of h motors each and finally resuming of the regulation by the shifting of the slide.

Of course, the return to the lower connection will take place by effecting the reverse operations.

In the case when owing to necessities of con-

struction the regulation on the resistance r would be insufficient for obtaining a good intersection of the transition curves, it would be possible to use by causing a suitable current to flow therethrough the winding E_1 provided for accessory working of the locomotive (stabilisation, recuperation and the like) and this in the additive or antagonist form with respect to the winding E.

Of course, and as in the preceding case, the transition can be effected between two other characteristics than the maximum and minimum shunting and field reinforcement characteristics respectively.

The diagram of Figure 16 shows another embodiment of the connection of the winding E, carried out in view of reducing the dimensions of the said winding and, therefore, of the resistance r, in the case when the intensities flowing through both these elements would be too considerable.

The connection of both these elements with the terminals of a supplementary resistance p (which, moreover, could be possibly an adjustable resistance) connected in series with the parallel branches permits to obtain this constructive amelioration.

It is obvious that all what precedes is not limited to the use of motors of the typical mechanical and electrical construction. Thus, the mode of transition which forms the subject matter of the invention is applicable to motors comprising in one and the same unitary frame a plurality of armature and the corresponding inductor as far as it is possible to split up the said inductors and to couple the armatures.

By extension, moreover, the same mode of transition is also applicable if, on one and the same collector, it is possible to pick up different voltages by means of suitable lines of brushes, in which case the couplings could be effected between the lines of brushes, on the one hand, and the inductors, on the other hand.

In a like manner, the method can be applied if one and the same motor comprises with a single armature a plurality of collectors each of which possesses lines of brushes which are adequate to the various windings, it being then possible to make the groupings between the lines of brushes corresponding to a series of windings in the series, series-parallel and possibly parallel form. Then these various grouping would form the various series-parallel branches which have been contemplated above, which series-parallel branches would comprise in each series-branch the corresponding fractions of inductor windings and deliver through their connection in series-parallel or parallel on the single chain corresponding to the totality of the complementary fractions of the elementary machines.

If one considers that the progression or the regression of the fundamental curve of the above contemplated motor unit can be obtained, for instance, by the rotation of the lines of brushes, it can be desirable to apply the method in order to insure the passage from a brush position corresponding to the maximum curve of the lower connection to the shifted position corresponding to the minimum curve of an upper connection.

For this purpose, the regulation which in the preceding examples was obtained by acting on the complementary chain can be obtained in the contemplated case by suitable shiftings of the brushes. To this regulation by shifting can be adjoined, moreover, the regulation on the complementary chain as described above.

In the preceding one has seen that the regulation in view of the transition was obtained in most cases and in the most convenient manner through the regulation of the complementary inductor chain. It can be advantageous, however, in certain cases, to effect this regulation and to obtain more particularly a high shunting curve for the lower connection by short-circuiting in each branch all or part of the windings which are constantly connected with the elementary motors. It is obvious that the effect which will be obtained will be a raising of the curve if one diminishes the working winding fraction or the intensity of the current which flows through the latter. A reverse control will insure the desired lowering in the case of the upper connection.

Of course, this does not exclude the concomitant or subsequent working of the regulation of the complementary chain or any other adequate regulation.

In the case shown in Figure 9 of the application P. V. No. 453,902 of December 30, 1940, to which it has been referred above, where the armatures alone accompanied by their respective changing over windings appear in the parallel branches, while the totality of the inductors forms a single chain arranged in the like manner as was the complementary chain in the other embodiments (connected or separated), the above described mode of transition is applicable, of course, without any difficulty.

Transition or recuperation.—In all what precedes one has simply contemplated the transition out and back between two connections working in motor. The same system is integrally applicable for the transition out and back when running with recuperation. For this purpose, it is sufficient that the whole of the diagram provided for the recuperation, i. e. the diagram comprising the exciting means for the single inductor chain as desired in order that the armatures work as dynamos, permits for a given speed the intersection of a low curve of the upper connection with a high curve of the lower connection (more particularly with the use of a winding such as E_1, Figures 15 and 16).

In recuperation, indeed, the most interesting transition is that which permits the passage from an upper to a lower connection.

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METHOD OF TRANSITION FOR PASSING FROM A CONNECTION TO ANOTHER IN COUPLINGS OF DIRECT CURRENT MOTORS

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Serial No. 446,374

4 Sheets-Sheet 1

Fig. 1

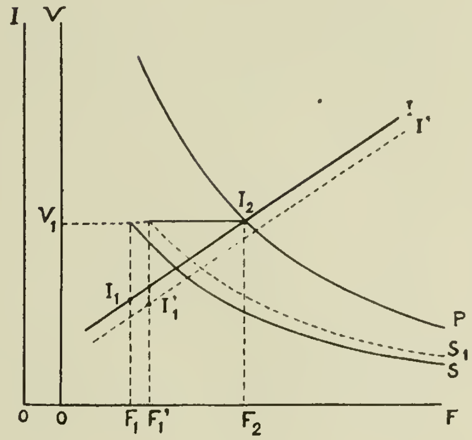


Fig. 3

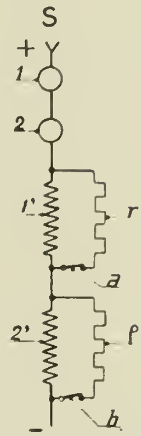


Fig. 2

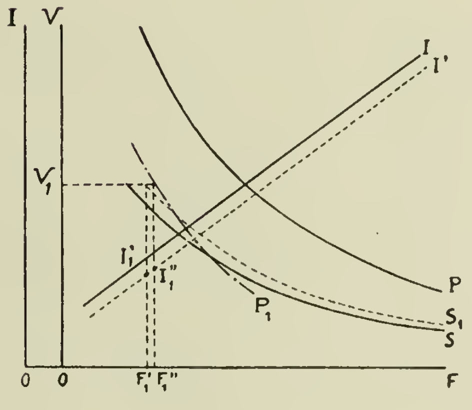
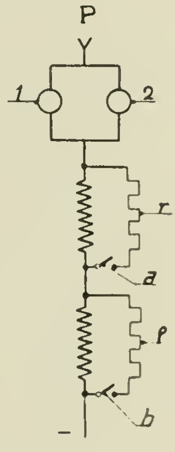


Fig. 4



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4 Sheets-Sheet 2

Fig. 5

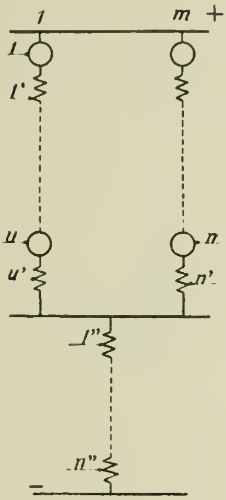


Fig. 6

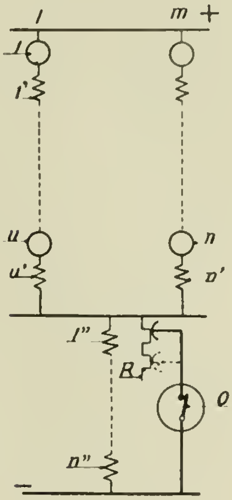


Fig. 7

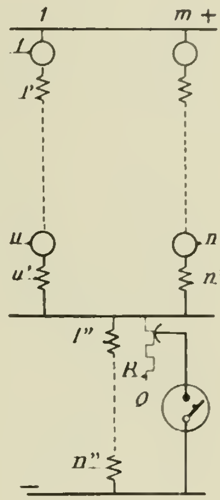


Fig. 8

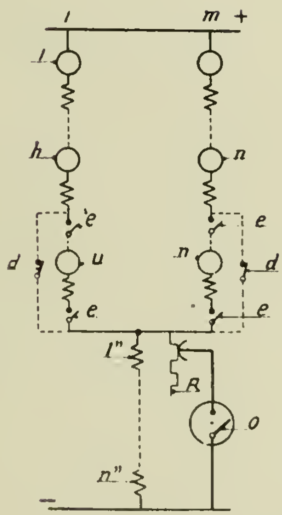
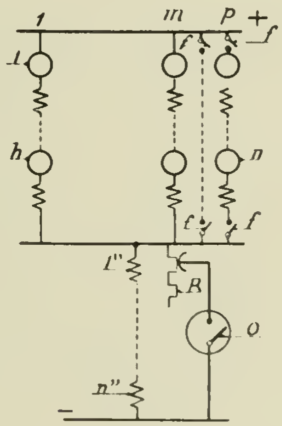


Fig. 9



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BY A. P. C.

P. M. J. S. DE GIACOMONI
METHOD OF TRANSITION FOR PASSING FROM A CONNECTION TO ANOTHER IN COUPLINGS OF DIRECT CURRENT MOTORS
Filed June 9, 1942

Serial No. 446,374

4 Sheets-Sheet 3

Fig. 10

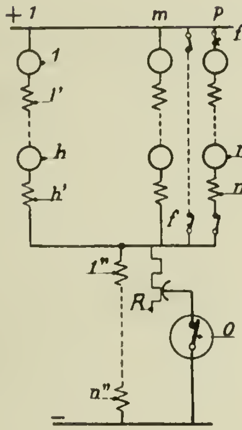


Fig. 11

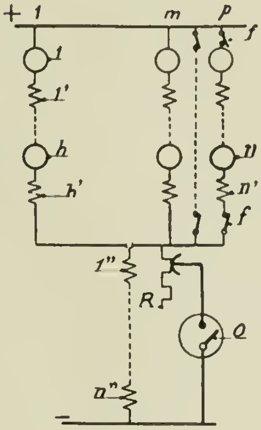


Fig. 12

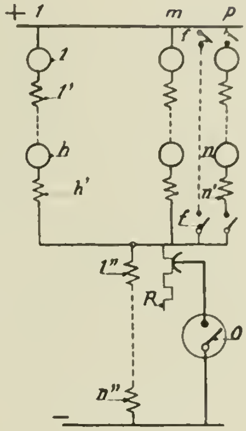


Fig. 13

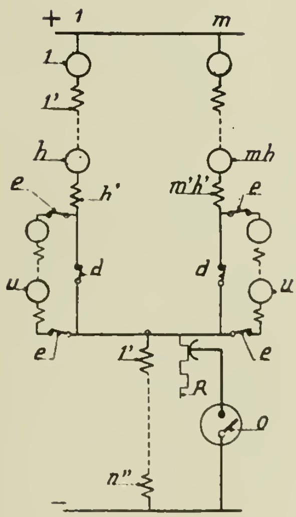
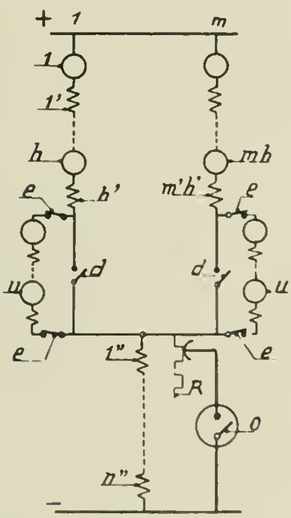


Fig. 14



Inventor

Paul Marie Jacques Severin de Giacomoni

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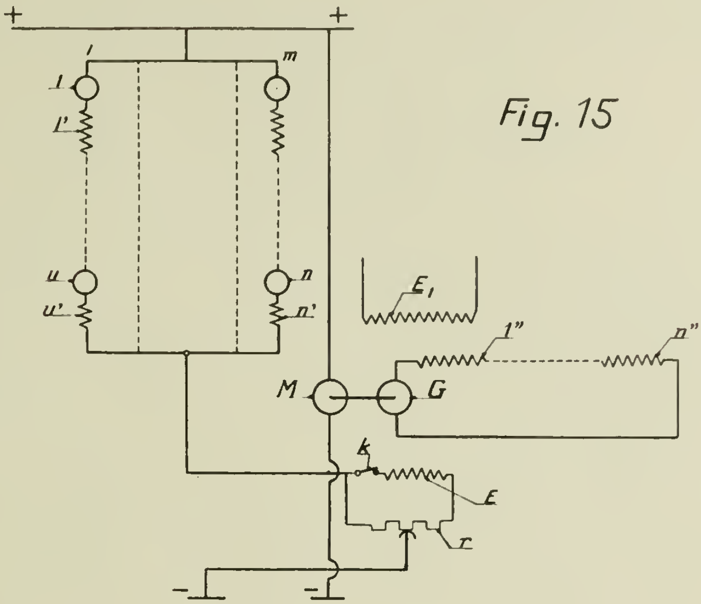

Fig. 15

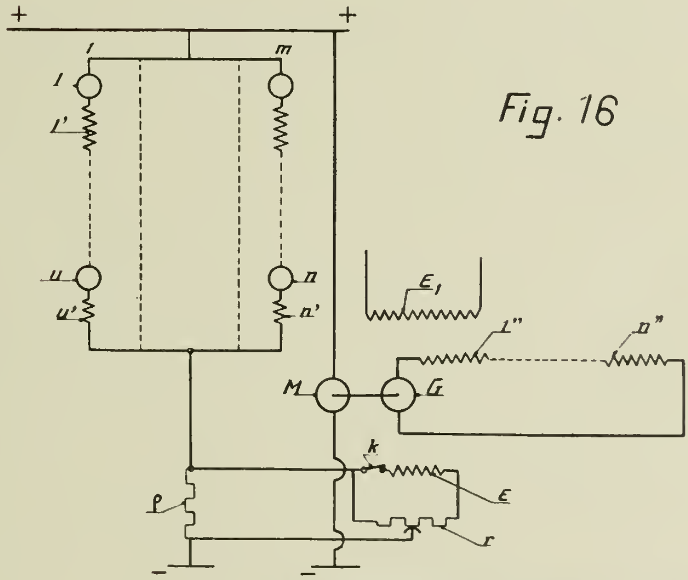

Fig. 16

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ALIEN PROPERTY CUSTODIAN

MECHANICAL-ELECTRICAL SOUND REPRODUCER

Georges Courcy, Le Pecq, and Marcel Paul Durand, St-Germain en Laye, France; vested in the Alien Property Custodian

Application filed August 14, 1942

The invention relates to a mechanical-electrical sound-reproducer for groove talking machines.

For said machines use is generally made of magnet or crystal sound reproducers (known as "pick-up") the disadvantages of which, as regards weight and fragility, are known, and the sound-giving efficiency of which becomes weaker with use.

Said disadvantages are avoided in the sound reproducer which forms the subject matter of the invention which is essentially characterised by the fact that the vibrations of its needle (or sapphire point) act, through the moving component which supports it, on one or more charges of dust or grains of carbon—or on some other similar conducting substance—each of which is secured within an elastic, supple and insulating housing and subject to a pressure which is separately adjustable for each single one of them, each charge being traversed by an exciting current which is thus modulated by the vibrations of the moving component, which exciting current may be provided by a cell, an accumulator or rectified current while the modulated current may then be transformed so as to be sent to the amplifier.

It is therefore the mechanical vibrations of the needle or of the sapphire point caused by its friction in the grooves registered on the disk or cylinder of the talking machine which are here directly utilized for the purpose of acting on the potential modifier or modifiers which are constituted by the charge or charges of granulated carbon but said charges are immobilized by a pressure which is sufficient to prevent any friction of the grains against one another or against the surfaces with which they are in contact, thus avoiding the parasitic noises which might be set up by such friction.

It will be readily understood that the trepidations of the apparatus as a whole thus have no effect on sound production and that the sound is modulated solely by the vibrations of the moving component.

The attached figures shown non-restrictive examples of forms of embodiment of the invention. Figure 1 is a sectional view of a reproducer the moving component of which is constituted by a diaphragm or blade capable of flexing. Figures 2 to 4 are views of reproducers in which the moving component, which is itself rigid, is articulated about knife-edges: Figure 2 is an embodiment including only one charge of carbon, Figure 3 is an embodiment with two opposed charges, Figure 4 is an embodiment with four opposed and balanced charges. Figure 5 is a variant of Figure 4 in which the moving component is not articulated about knife-edges but merely held by the sullpe substance in which the carbon charges are embedded.

In said figures the same numerals indicate the same components: 1 and 2 are the two portions of the housing made of an insulating substance assembled by bolts 3; 5 is the needle which is rendered solid with moving component 6 by means of binding screw 7; 8 are sleeves made of flexible substance (such as rubber, gelatin, etc.) interposed between the housing and the moving component and preferably glued to said components to constitute cavities accommodating the charges 9 of granulated carbon or of some other similar conducting substance on each of which the pressure can be adjusted by a cap 10 screwed into the housing.

In the example in Figure 1 the moving component is constituted by a flexible blade or diaphragm squeezed between the two portions of the housing; in Figures 2 to 4 the moving component is solid and articulated about knife-edges 11 and 12 which are integral with the two portions of the housing; in Figure 5 the solid moving component is held by the supple substance which constitutes sleeves 8, which substance may with advantage be extended to a greater surface in order to increase the holding of the moving component in relation to the housing.

The current to be modulated is led, on the one hand, to the moving component by wire 13 and, on the other hand, by wire 14 to cap 10 which is assumed to be conducting, both said components thus being in contact by means of the carbon charge 9 which forms a resistance. In the case of Figure 3, a third wire 15 connects the second cap 10 to a compensated mounting (push-pull). In the case of Figures 4 and 5, wire 14 leads to two caps 10 diametrically opposed with respect to the centre of oscillation of 6 whereas wire 15 leads to the other two caps 10.

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Fig.1

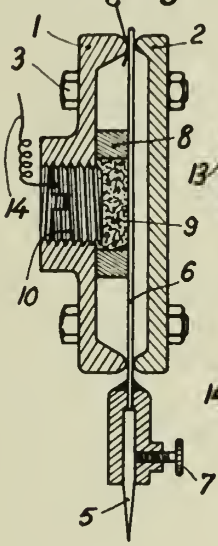


Fig.2

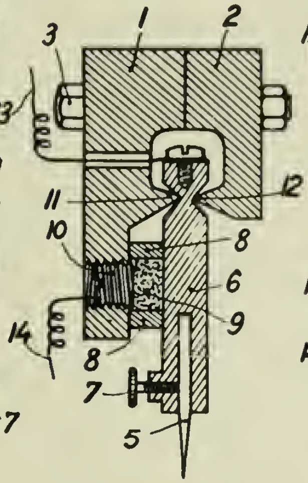


Fig.3

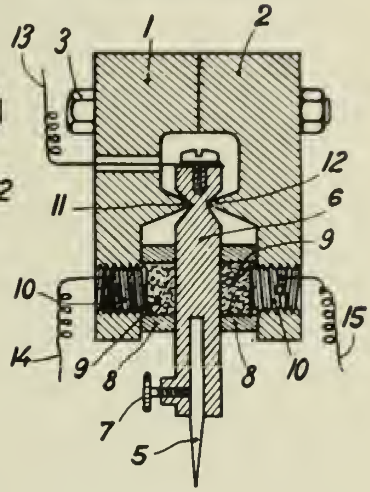


Fig.4

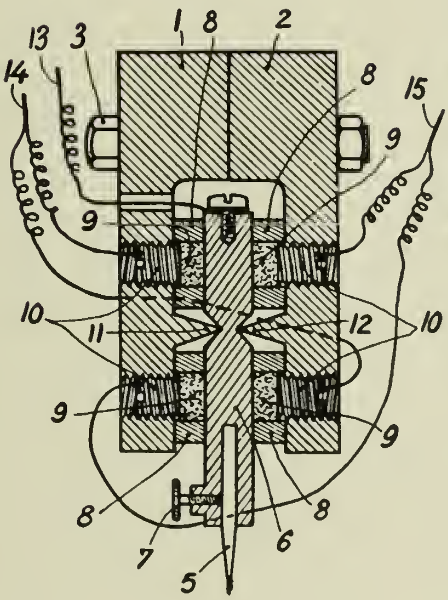
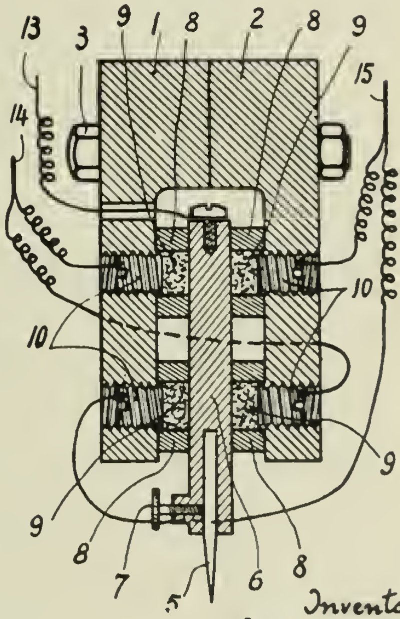


Fig.5



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Said disadvantages are avoided in the sound reproducer which forms the subject matter of the invention which is essentially characterized by the fact that the vibrations of its needle (or sapphire point) act, through the moving component which supports it, on one or more potential modifiers each constituted by a flexible metal blade or spiral the pressure of which, separately adjustable for each modifier, causes a more or less extensive contact on a conducting surface; each modifier being traversed by an exciting current which is thus modulated by the vibrations of the moving component, which exciting current may be provided by a cell, an accumulator or rectified current while the modulated current may then be transformed so as to be sent to the amplifier.

It is therefore the mechanical vibrations of the needle or of the sapphire point caused by its friction in the grooves registered on the disk or cylinder of the talking machine which are here directly utilized for the purpose of acting on the potential modifier or modifiers.

It will be readily understood that the trepidations of the apparatus as a whole thus have no effect on sound production and that the sound is modulated solely by the vibrations of the moving component.

The attached figures show non-restrictive examples of forms of embodiment of the invention. Figure I is a sectional view of a reproducer the moving component of which is constituted by a diaphragm or blade capable of flexing. Figures 2 to 4 are views of reproducers in which the moving component, which is itself rigid, is articulated about knife-edges: Figure 2 is an embodiment including a single modifier, Figure 3 is an embodiment with two opposed modifiers, Figure 4 is an embodiment with four opposed and balanced modifiers. Figure 5 is a variant of Figure 4 in which the moving component is not articulated about knife-edges but merely held by the flexible spirals of the modifiers.

In said figures the same numerals indicate the same components: I and **2** are the two portions of the housing made of an insulating substance assembled by bolts **3**; **5** is the needle which is rendered solid with moving component **6** by means of binding screw **7**; **8** are capsules of a resistant conducting substance such as agglomerated carbon, **9** are conical metal spirals the contacting surface of which, with **8**, varies with the oscillating of **6** and on each of which the pressure can be adjusted by a cap **10** screwed into the housing.

In the example in Figure I the moving component is constituted by a flexible blade or diaphragm squeezed between the two portions of the housing; in Figures 2 to 4 the moving component is solid and articulated about knife-edges **11** and **12** which are integral with the two portions of the housing; in Figure 5 the solid moving component is held by the flexible spirals of the modifiers.

The current to be modulated is led, on the one hand, to the moving component by wire **13** and, on the other hand, by wire **14** to cap **10** which is assumed to be conducting, both said components thus being in contact by means of the spiral **9** and capsule **8** forming a resistance. In the case of Figure 3, a third wire **15** connects the second cap **10** to a compensated mounting (push-pull). In the case of Figures 4 and 5, wire **14** leads to two caps **10** diametrically opposed with respect to the centre of oscillation of **6** whereas wire **15** leads to the other two caps **10**.

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Fig.1

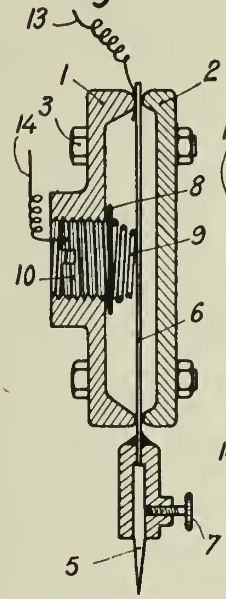


Fig:2

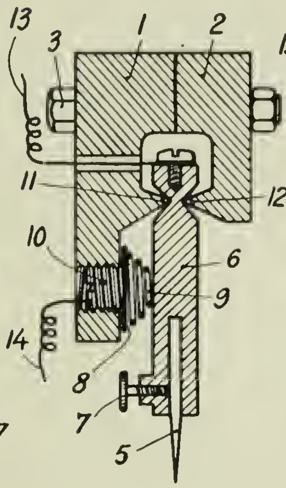


Fig.3

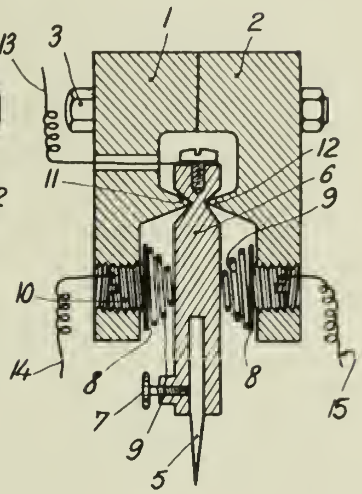


Fig.4

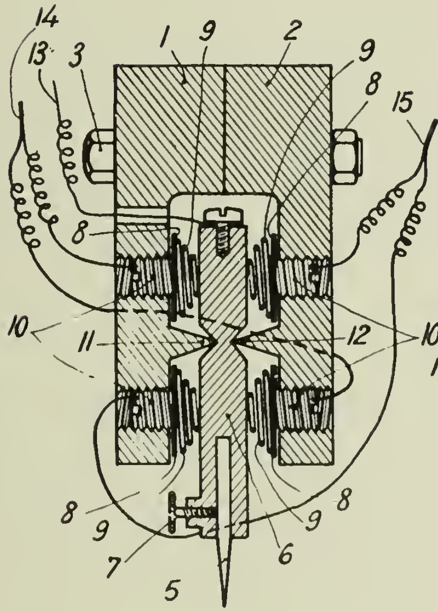
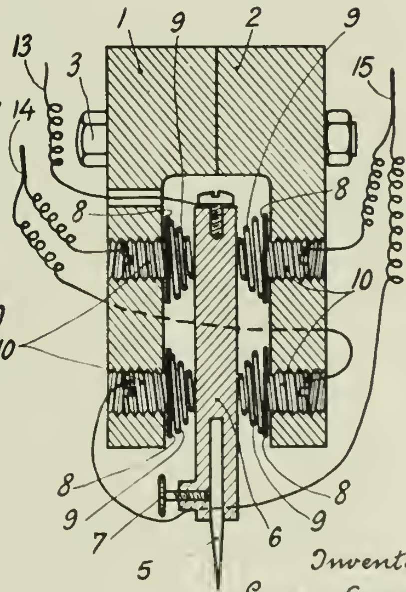


Fig.5



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